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VOLUME ONE

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NEANDERTHAL FLINT WORKERS INTERRUPTED BY THE SIGHT OF PREY BENEATH THEIR CAVE HABITATION

Man's discovery how to extend his functions by the use of implements lifted him out of the ruck. Wooden tools, probably with but little secondary adaptation for the use in view, must have preceded flint, but for long eons the only thing to mark Man's progress is the slow improvement in the technique of flint-chipping. This scene, well authenticated save for irrecoverable details of hair and skin coloring, is of a Neanderthal family in the Mousterian culture phase.

Reconstruction by Charles R. Knight, courtesy of American Museum of Natural History

UNIVERSAL WORLD HISTORY

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J. A. HAMMERTON

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VOLUME ONE

Pages 1-306

FROM THE EARLIEST TIMES
TO THE EGYPTIAN EMPIRE
4000-1580 B.C.

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MCMXXXIX

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THE EDITOR'S FOREWORD

THIS History is an entirely new and original work. Indeed, it may be claimed that in form and contents it is unique among histories of the world.

The effort has been made to tell in a new way the enthralling story of Man's performance in the drama of Human Destiny, still playing on the vast stage of Earth. And I believe that, ambitious though the project may appear when thus stated, the brilliant company of experts here brought together have not failed me in their inspiring task. It has been required of each that he should describe or interpret the Past as vividly as the journalist chronicles the fleeting hour, but in that more correct perspective which only time can give.

The distinctive features of this Universal World History can best be indicated in the following sequence:

1. A continuous narration of events is achieved by dividing the period of record-history—during which Man has been making monuments or compiling annals—into ten Eras, the history of which is told in a series of thirty-five instalments, entitled Chronicles, covering varying periods of time. Throughout these Chronicles, history is treated as one great stream, into which flow numerous affluents, and if, at times, it is necessary to go to the source whence the newest tributary comes and to follow its course, we shall always in the end see it join the main stream. In our Chronicles we are concerned chiefly, though not entirely, with outward manifestations, with the shifting scenes of large and decisive movements in the life of nations, with events and personages. The principles underlying the events are sought out and expounded.

2. Our Interpretative Studies. These Chapters, which are separately numbered, are in every case the work of specialists, whose peculiar knowledge of their subjects renders their judgments worthy of acceptance, and makes the whole body of our Study-chapters unequalled for instructiveness and authority.

Each Study-Chapter is introduced at the moment in history when it has become important to the true understanding of the narrative embodied in the Chronicle. Thus we travel down the corridors of Time accompanied by the scholars who can best interpret to us the spirit of the times through which we pass.

3. Our Pictorial Documents also form a vital part of the work, and have been sought for with the single aim of illustrating and amplifying the text. Though numbering some three thousand, none of them is without its special significance. The illustrations, indeed, are as much a part of the fabric of our History as the text itself, and only those who have had the task of aptly illustrating a book can guess what patience, energy and expert knowledge have gone to assembling from all parts of the world the many thousands of historical documents that find a place in this History.

We have avoided the tendency to make our history a mere chronicle of heroes; and although many of our chapters are concerned with the character and achievement of great men, we largely interest ourselves through all the ages in the life of the common folk. Hence, the Universal World History might be described as chronicling the progress of Mankind throughout the ages against a background of social life.

J. A. HAMMERTON

CONSPECTUS OF THIS WORK

THE contents of the Universal World History are briefly set forth in these four pages. Here are displayed the titles of its twelve editorial divisions, and the descriptive names and dates of the 35 Chronicles into which the ten Eras of general narrative have been divided; together with the titles and authors of the special Studies that follow each Chronicle and interpret the principles underlying the events narrated, or amplify the purely historical information by sketching more vividly the religious, social or aesthetic background of the times.

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CLASSIFIED LIST OF MAPS

WHAT IS THE USE OF HISTORY?

A QUESTION TO WHICH AN ANSWER IS OFFERED BY AN EMINENT HISTORIAN IN THIS INTRODUCTORY STUDY

GEORGE MACAULAY TREVELYAN, O.M., Litt.D., LL.D.

Regius Professor of Modern History in the University of Cambridge; Author of 'History of England,' 'England Under Queen Anne,' etc.

WHAT is the use of history? What end is served by this branch of study, which partakes of the nature both of science and of literature? Does it fall between those two stools, or has it both those strings to its bow, and a value of its own as well?

The uses of pure science are clear enough. It increases the material well-being and comfort of Man, besides adding enormously to his powers of self-destruction when the mad fit seizes him. For good and for evil the modern world is the creation of modern science. The practical uses and abuses of the discoveries of physical science are plain to all of us. The uses of pure literature are also clear—to give delight, solace and elevation to the thoughts of Man, to charm his leisure, to educate his mind and soul.

But what is the use of history? Its discoveries add nothing to the material power and well-being of our race. Even the most "scientific" form of history—modern archaeology—is scientific in its methods alone, and cannot claim for its results the practical importance belonging to the discoveries of physical science.

When Sir Arthur Evans discovered the long-lost civilization of ancient Crete, he did nothing to prepare any change in the economic fabric of society, nor did he enlarge in any respect the command of Man over Nature. The sole value of his discovery lay in the enlargement of the scope of Man's thought and in the increased brilliancy of Man's imagination about the past. Wasp-waisted girls jumping over bulls in crowded arenas four thousand years ago, upper-floor drainage in the Palace of Minos or Alcinous—these visions leave the world of today materially unchanged. They feed our minds but not our bodies.

Regarded as a science, history cannot, therefore, claim the same importance for its results as those claimed by physical science; neither can history claim for its results or methods the same accuracy or certainty as those of the laboratory. A gas or a black-beetle can be completely and accurately analyzed. A revolution or an epoch cannot.

The reason why an historian's work is worth doing at all, in spite of its necessary incompleteness and inaccuracy judged by scientific standards, is that a revolution or an epoch is much more interesting than a gas or a black-beetle. They are more highly developed and more spiritual portions of the world of Nature or of God. But for that very reason they cannot be so clearly and accurately analyzed as the gas and the black-beetle.

History is a science, in so far as the spirit in which the very imperfect evidence is collected and collated should be a scientific spirit. But beyond that we are in another sphere, and the analogy of the physical scientist fails any further to apply to the historian.

But if history is handicapped in both its methods and its results when judged as a pure science, it is handicapped also if considered as pure literature. There need, it is true, be no limit to the amount and quality of literary genius or talent employed by the historian—as Thucydides and Tacitus, Gibbon and Carlyle, have shown. And there is nothing in modern historical method to prevent a repetition of similar work, except the non-recurrence of men of the same magnitude.

But history has not, and never has had, the same literary freedom as pure literature. It must be the slave of the fact. The material for its narrative must be supplied not by the imagination, but by the severe and scientific method used for eliciting the actual truth about the past.

It is seldom that the historian, even the

biographical historian, can be as intimately at home behind the scenes of the human drama as the novelist or dramatist can be in the hearts of the characters which he himself creates. Cromwell may have been as interesting a human being as Hamlet—more interesting, indeed, because he really existed. But we can never know Cromwell as well as we know Hamlet, because the records of history are less intimate than those of fiction.

Shakespeare, indeed, deals in historical themes. He makes us know Richard II and Mark Antony through his own imaginary version of them. But history's version is much more blurred and sketchy in its portraiture of those two persons. Shakespeare has never attempted the historical method, but has employed poetry and fiction on an historical subject. That, of course, is not historical truth, though history may have inspired it.

On the other hand, Boswell's Johnson is the real historic Johnson leaving on the reader the impress he left on his own friends in the real world. Boswell, therefore, is one of the great historians, for he has recorded truly the form and pressure of a real man with the intimacy and realism that are usually found in fiction alone.

Besides its limitations in the power of intimate portraiture of persons, history as literature suffers from another disadvantage. The forms and arrangement of the story cannot be carried out exactly as the literary art would require. "Artistic truth" has perpetually to be twisted and cut short to suit the iron demands of historic truth.

On rare occasions, indeed, historic truth is stranger, more dramatic, more satisfying, more poetic than any fiction could have been. When one of those lucky moments falls into the hands of a great master of historical narrative, like the Revolution of 1688 into the hands of Macaulay, art and history move for a while in perfect harmony. But those are the rare and fortunate chances. History, at its best, is literature; but it is literature in trammels to hard fact.

Yet it is this relation to hard fact which gives history its value, and justifies its claim to amuse the leisure of readers and to occupy the life of students. Our interest in history depends on our belief that it represents, however imperfectly, events that once had real existence in time and space.

Now, to give a true picture of any period in the past, there is need not only of the scientific spirit to collate the evidence, but of the literary art to paint the picture that emerges. For the living truth about human beings in the past, with all their complex affairs and affections, cannot be given solely in a dead category of facts. The past was warm and actual, and the historian must represent it warmly or he gives an impression that is partially false. Dull history is false history, for the past was not dull when it happened. Cold history cannot be accurate history, for the past was hot and living. Yet hot history is equally misleading if its heat is that of modern partisanship or individual fancy and not a reflection of the heats of the actual past.

History is, therefore, the most difficult of all forms of authorship; for it requires a union of scientific and literary methods never found to perfection in a single historian. In one sense Gibbon is nearly "perfect," yet his "perfection" is gained on condition of limitations of scope and sympathy which render his picture of fifteen centuries very far indeed from complete. There are, therefore, no perfect histories.

Failing that, there should be a great variety of types of historian and of types of history. Many different imperfections are the best substitute for unattainable perfection. A single man of science may understand all about the beetle's body; but no single historian can understand all that there was in the mind of an epoch or of a nation.

The myriad types of human society, circumstance and thought that have existed on earth, so different from one another as well as from our own—to teach this is the great object of history; and so show also how and why these types and conditions of life constantly changed, slowly evolved, or were violently broken and replaced. The manner of life of those who were before us, in its difference and its likeness to our own—that is the supreme interest of history. The narrative of events, however stirring at times, is inter-

esting chiefly as it illustrates and explains the more general theme of what our ancestors were like.

A mere string of events, political and military, the names of battles and kings, of ministers and states that rose and fell, have their chief value as the necessary skeleton on which to hang more important knowledge. Yet two hundred years ago history consisted of little else.

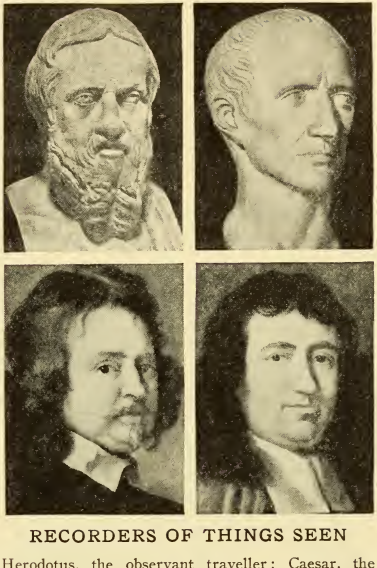
In Stuart times the only works of real historical value, by modern standards, were contemporary memoirs, like Clarendon's and Burnet's. Men understood the events they had themselves witnessed, but the remoter past was hardly understood at all. Lists of kings and battles made it up, and no one realized how much the epochs of each of those kings had differed one from another. Lear, Canute, Henry II, Charles I—it was all one.

Human nature no doubt is constant, but it is not as constant as all that. In early Stuart times artists could still represent the persons of five and ten centuries back dressed in the same clothes and armor as themselves. That was but an outward and visible sign of a complete spiritual ignorance of the real past.

The antiquarianism of the eighteenth century first began to improve this state of historical ignorance. Publications like Percy's "Reliques of Ancient English Poetry" prepared the way for Sir Walter Scott, who first popularized the idea that each passing age has had its own peculiar form and fashion, not only of dress and armor, but of thought, custom and character.

The patient antiquarian scholarship has developed since Scott's day into a thousand flourishing branches of endowed research, and has been given the rather forbidding title of Scientific History. Call it what you will, it is one of the great formative influences in our latter-day civilization.

This closer knowledge of the past plays an immense part in modern thought, controversy and education. No reform movement, no propaganda can be started today without some appeal to history—often, I am bound to say, grossly inaccurate and one-sided. It is one of the functions of true history to correct those exaggerations. In education and in the fostering of ideals for the present and future, knowledge of the ideals of the past is a principal inspiration.



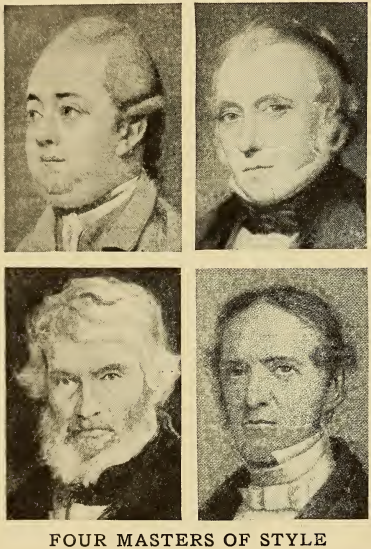
RECORDERS OF THINGS SEEN

Herodotus, the observant traveller; Caesar, the brilliant narrator of his own campaigns; Clarendon, the Restoration statesman; and Burnet, who wrote his memoirs a generation later—these typify the eye-witness turned historian.

It works in a thousand different ways, far beyond the realm of the historian's study, whence it originates. Even before the rise of modern history, the course of the world had more than once been deflected and its greatest movements had been inspired by historical study. The Renaissance of the fifteenth century was a rediscovery of the literature and ideals of ancient Greece and Rome. The Reformation, particularly the popular Reformation in England under Elizabeth and the Stuart kings, was the study by squires and merchants, ploughmen and tinkers, of the sacred books of the Hebrews—truly the most astonishing feat of historical popular education there has ever been.

Those two examples remind us that the literature of past ages is the most living and the most accurate form of history. Homer and the Bible are "original documents," far more enchanting than any modern histories that can be composed out of them or around them.

One great function of modern history is to elucidate the literature of the past to the modern reader, by placing it in its proper setting. Fully to understand the Bible, Homer, Aristophanes, we require to be told what modern scholarship has discovered about conditions in ancient Palestine, Asia Minor and Athens. How immensely our delight, as well as our understanding, is increased when we read these books in the light of that knowledge! The intellectual pleasure of reading the great literature of past ages, be it Chaucer or Dante, Shakespeare or Milton, is doubled by historical knowledge of those times. Nor is there any better way of obtaining historical knowledge than by reading portions of history as a comment on great works like those.



FOUR MASTERS OF STYLE

With Gibbon, who dissected the Roman Empire 1,300 years after its fall, we rank Macaulay—picturesque if often partisan—and Carlyle with his theory of individual greatness; while Prescott devoted his gifts to the early history of America.

In this way history and literature are closely connected. Even economic historians make constant appeal not only to statistics and blue books but also to the novels and literature of the eighteenth and early nineteenth centuries as valid contemporary evidence of social conditions and class relationships. How much, indeed, the pleasure of reading Defoe and Fielding, Jane Austen and Dickens, is increased by familiarity with the history of their times!

And how much light do those works throw back on history! No reader of "Mansfield Park" will ever make the mistake of supposing that the country gentlemen and their families were concerned about the Napoleonic Wars in the way in which all classes were necessarily concerned about the Great War of our own day. And history proper will confirm and explain the reasons for that circumstance. Much of George Borrow and most of Peacock are unintelligible to persons ignorant of the history of England under George IV and William IV. And those two delightful writers died within the memory of persons still living. So fast does literature become history, or require at least the comment and exegesis of the historian!

What is the passion that inspires the historian, and what is the motive that creates the demand in others for the results of his work? It is the desire of Man to emancipate himself, at least in imagination and knowledge, from the doom pronounced upon him at his birth of lifelong imprisonment in a single century and in a single set of material and intellectual circumstances.

We mount the primitive encampment beside the dew-pond on the Downs, and recall the life of the men who reared it to defend their flocks and families against wolf and bear and neighboring tribe. We trace the Roman road now running green through the silent countryside; we find the foundations of villa and temple in the woods that have hid them for so many centuries. But in dealing

with those early times in Britain much has to be left to the imagination, working within the lines traced by the spade of the archaeologist. Rudyard Kipling's imagination helps out Haverfield's knowledge.

As we approach nearer to modern times, the intensity of true historical interest increases, because the realm of knowledge becomes greater. Imagination is still brought into play, but it works on a far more solid and broad basis of known fact. Our knowledge of our ancestors ceases to depend on deductions made from a flint, a carved stone, a skeleton or a spearhead dug up at a certain position.

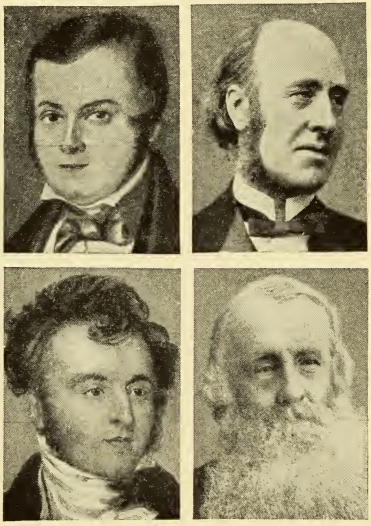
Contemporary chronicles of political history, economic and legal documents, enable the historian to reconstitute a series of detailed and accurate pictures of successive states of society, each profoundly different in material and intellectual circumstance and organization from the society in which we live our lives today. The variety of Man's experience in time, particularly during the last few so rapidly changing centuries, has been astonishing, and nothing but history can reveal it to us.

To compare these different states of society, in the Dark Ages and the Middle Ages, in Tudor and in early Hanoverian times, with each other and with our own society, is profoundly educative. It is as an education to the mind that history has its only value. Utilitarian and material value it has none. Nor can any hard and fast laws of politics be deduced from a study of the past, nor any prophecies about the future made. The ways of Man are too complex to be reduced to a set of rules.

But there is no better training for the mind in sympathy, imagination and understanding than that which is given by the study of history. For wisdom is won by experience, and history enlarges our experience of Man. The different ideals aimed at by our ancestors in the various ages of the past give us new criteria by which to judge of the merits and defects of the civilization of our own day, much as foreign travel enables one to estimate aright the faults and virtues of our own civilization.

There are, of course, dangers in an incomplete or prejudiced study of the past. The Chauvinist feeds his racial passion on the history of the wrongs and glories of his land, and views the past of all other countries in that light alone. The religious or political zealot reads with eager joy of the days when his church or party bore absolute sway, forgetting how different from our own was that world in which such predominance was normal. The partisan of the upper, the middle or the working class selects a version of economic and political history that leaves out half the relevant facts and considerations. True history has a hard task to correct these vagaries, and many popular misconceptions, sometimes based on shallow ignorance, sometimes on one-sided learning, are rife today in the most various quarters.

The best panacea for this evil is the study of history in its various aspects.



STUDENTS OF HUMAN SOCIETY

As annalists of Man's institutions there stand out Buckle, Lecky, Grote and Freeman. The first two took England for their field, Grote made Greece a vehicle for the praise of democracy, and the last was a brilliant political historian.

Ecclesiastical and political history can be very misleading if studied *in vacuo,* but fall into their proper places in the scheme of human life if studied together with economic, social, legal and intellectual history. Social history best holds the general scheme together. For the changes in the relation of classes are caused mainly by economic and industrial change, and are in turn the underlying causes of political, ecclesiastical and legal change.

Casual events such as wars, battles, discoveries and great men have their place in these movements of more slowly working general causes. To watch how these various activities of Man cross and recross each other as cause and effect, is the highest education to be won from historical study. In the wisdom that comes of that study lies the true value of history to the statesman, and the soldier, the priest, scholar, journalist and citizen.

The evolution of Man in society, in all ages and in all countries—nothing less than that is the subject of history. What each passing phase of society was like in each time and place, what were the qualities of its individual great men and of its common folk, how it came into being and how it was in its turn transformed into something different, what general causes and what unexpected catastrophes or deliverances wrought each change and gave its peculiar quality to each passing age—those are the problems of history. What could be more interesting to Man than such a study? What are gases and black-beetles compared to it? Yet we historians have not been so much on a level with out task as the physical scientists with theirs. For history requires higher qualities of mind for its never-attainable perfection.

It is no wonder that history is to a considerable extent replacing "classics" as the principal humane study. Like most changes in human affairs, this change is not an unmixed blessing, although it is a necessary transition. The great value of classics was that it gave an education in the literature and history of a great civilization which was very different from our own, but out of which our own has grown. And the same may be said of the study of the Bible. Modern history will be hard put to it if it is to give so good an education and so liberal an education as that which our ancestors used to get from the study of the Bible and the classics together.

In our age history is more and more becoming social history. What we moderns chiefly desire to learn from the records of the past is the physical, political, domestic, economic and intellectual conditions under which men and women have lived in the various ages and lands. The danger is that in answering this class of question history should lose the personal and dramatic interest which narrative history and biography can more easily attain. If social history deals only in abstractions and generalizations, it loses its value, which consists in enabling us to imagine what our forefathers' lives were in truth like.

Now our forefathers' lives were not abstractions, but concrete, full-blooded realities. A well-known history tutor wrote to me of an undergraduate: "He is singular among my pupils in treating history as though it had really happened." There lies, then, a danger of teaching history in abstract generalizations. Students may not feel "that it really happened," yet the essence of history is its reality; otherwise it is only bad fiction.

This danger of inhuman abstraction is to be corrected by constant reversion to detailed cases and personal instances. That was how the greatest historian of our century, Maitland, made the life of the Middle Ages alive again to his pupils and readers, although his theme was medieval law. He was never content with expounding an abstract rule or principle of law until he had illustrated it by some concrete example taken from some veritable record of his year books or manor rolls, and shown us the passions and follies of real men and women as they worked in and through the quaint laws and rough justice of their day.

When we pass from the realm of social history, and from the history of institutions and conditions of life, to the more old-fashioned narrative history, here at least there should be less danger of losing touch with the reality of the past through dealing over-much in generalization. Narrative history has every opportunity to be human, dramatic, actual; and it often is so, particularly in the hands of older writers of the so-called "literary" school,

of which Gibbon, Carlyle and Macaulay were the great exemplars.

Dull narratives of historical events are worse than dull generalizations about social history, for a generalization may have value even if it is dully stated, but a narrative has little or no value unless it conveys a living impression of how the things happened. It is the special function of narrative history to make us feel the reality of the past as if we were ourselves alive in it, spectators and sufferers in the event; in Carlyle's words, to "sweep away the illusion of time" and to place us beside our forerunners as one of themselves.

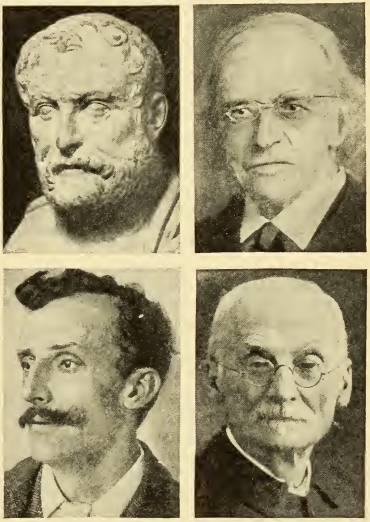
Carlyle's intense and vivid sense that the past was as real as the present constituted his great virtue as an historian. Endowed with a tense poetic and emotional nature, he satisfied it intellectually not in reading great works of poetry and fiction, for most of which he had all too little appreciation, but in reading the dusty records of the past and transfusing them by imaginative sympathy into the living actualities which they once were.

"History, after all," he writes, "is the true poetry. And Reality, if rightly interpreted, is greater than Fiction." That, I take it, is the imperishable, indisputable, wholly uncontroversial and incontrovertible part of Carlyle's poetry and philosophy. All historians or students of history who are to extract any good from their studies must have some touch of that attitude towards the past, that intense yearning to know about it, because it once actually happened long ago.

If it is a special function of narrative history to make the past actual and concrete, the same is true of biography. In biography we are to get the living man, the human creature, given back to us from beyond the grave. Abstraction has no possible place in biography; a man's "Life" must be particular and human or else be nothing.

The taste of the reading public today is much less favorably inclined to narrative history than that of the Victorian age; but one of its favorite forms of serious reading is biography, and it still consents to acquire historical knowledge in that way. Social history and biography are both in demand. They are indeed complements of one another. Social history tells us about the lives of our forerunners in the aggregate, while biography reproduces specimens of individual men and women.

The real treasures of the past, which



SCIENCE ALLIED TO HISTORY

Thucydides was the father of scientific history. With Teutonic thoroughness Mommsen made Rome his theme. Maitland stands for the investigation of original documents, while for Sayce archaeology unlocks the remotest past.

Photo, bottom right, Elliott & Fry

our age desires to recover for itself by the aid of history, are not the events but the men and women. The narrative of events is of interest mainly for the sake of the men and women who—individually or in aggregate—made the events and were part of them. Social history gives us the conditions of life and the ideals of life of ordinary men and women in past ages. Biography gives us the great characters and minds which those conditions produced at lucky moments, by the chances of birth and accidental circumstance.

Nature makes and breaks her types of

civilized Man in bewildering profusion, but she never reproduces them. Neither the class nor the individual, once dead, will ever again exist in the world, and only history can save some shadow and memory of them from oblivion. Never again on this mapped globe will voyagers burst into unknown seas, or Francis Drake tread the deck; the world will never again know the Puritan squires as a class, nor Oliver Cromwell as a man; neither the world of eighteenth-century culture, nor Dr. Johnson in particular, will ever again exist except in history. In history they live, and the contemplation of them has its influence, small or great, on the minds of our very different age. We lifelong prisoners of this latest age have other worlds of experience opened to us by social history and by biography.

Biography not only brings the human element into prominence, but gives a certain artistic unity, or at lowest a unity of purpose, to the book. The ordinary narrative history of a period is apt to be lacking in unity of design and purpose, to be in fact too like "time's doting chronicle," a kind of superior posthumous newspaper, selecting and rejecting events for record in a manner arbitrary or haphazard. But in a biography no one can complain of the omission of events not relative to the life of the man in question.

It is, however, true that a single biography is not only inadequate but positively misleading if taken by itself as the picture of a whole period. But there are many worse ways of studying a period than to read a number of biographies of different contemporaries and rivals, held together by some good study of the social conditions of the country and period that produced them all. A good biography should enable the modern reader to contemplate a period through the eyes of one of the great men who actually lived in it and wrought upon it. Multiply that process many times, and the reader of several good biographies has had the opportunity to view the same period from a number of different contemporary points of view.

But the functions of history are not confined to discovering and picturing past states of society and lives of individual men. History in its fullness is not a series of isolated and disconnected snapshots of the past; it aspires to be a continuous or "moving" picture. Its duty is to show how and why one state of society passed into the next by modification or by catastrophe. What were the causes of the rise and fall of the Roman Empire, of feudalism and of medieval Catholicism? Why and how did Parliamentary government develop in England, while France, divided by so narrow a strip of sea, went the way of Louis XIV and the Jacobin Revolution?

Such are the problems on which the ordinary man properly looks to history for guidance. How is the present linked to the past by causation and growth? How and by what mysterious processes of gestation and delivery have our age and society emerged from the womb of the past? And, similarly, how and why did each epoch in the past proceed out of the one that came before it?

To answer these immensely difficult but proportionately interesting questions, history is put to its fullest test. It is not enough that she should describe to us isolated episodes, epochs or lives. She must show the workings of cause and effect in human affairs, the relation of "inevitable tendencies" in social and political growth to the rival element of chance and catastrophe. She must apportion their respective weight in human development to accident and to growth, to war and to peace, to physical and geographic conditions, and to "great men" and the movements they initiated. She must demonstrate the reaction of economic change and invention on society, politics and religion, and the counter-action of human institutions, ideals and prejudices on the action of the "economic man" within his own particular sphere.

In dealing with these great problems much will clearly depend on the ability, the opinion and the outlook of the individual historian. There will always be many diverse opinions of these questions, and history can give no complete and few final answers to problems of this kind. Only in the multitude of researchers and interpreters will there be anything approaching safety in the conclusions arrived at.

For we historians are dealing with the elusive, many-sided, incalculable and variable spirit of Man in all his aspects. not

with the easily dissected body of a black-beetle, type of the bodies of all other black-beetles. Our knowledge of the thoughts and acts of men in the past is, even at its fullest, fragmentary in the extreme. Yet the more a man knows, the more he has thought and read on one of these problems, the more he has consulted the work and conclusions of other historians approaching the same subject from a different angle of research, opinion and experience, the more likely at least is he to come to conclusions containing part of the truth and relatively devoid of positive error.

"The judgment of history" is a phrase frequently and lightly used. In some sense, no doubt, all important actions, political and other, stand to be brought some day before that tribunal as the highest human judgment seat. But let us realize that the judgment of history is constantly varying, that successful appeals are constantly being made from the Court of History in one age to the Court of History in the next, from one historian to another, from one school to another. This does not imply that history's judgments are valueless, but that they are manifold, variable and seldom final. Indeed, the points at issue are too various and too subtle for any one judgment to cover all the ground.

In this matter it is well for laymen to bear in mind that because two historians often contradict one another, it does not follow that one must be wholly right and another wholly wrong in his point of view. On specific and detailed questions of fact—did Wellington meet Blücher the day before the battle of Waterloo?—there can, of course, be only one true answer. But to other questions—did France want Napoleon back in 1815?—there can be many true answers. And the further question, whether she was right in wanting him back, or right in not wanting him back, is the merest matter of opinion. "History" can give no infallible judgment on such a point; it can only suggest the grounds on which a reasonable opinion can be formed.

Laymen should also beware of supposing that the latest "judgment" of history is necessarily the right one; it may, it often does, merely reflect a current phase of modern political or religious thought which may be more, but may also be less, just than the political or religious thought of fifty years ago. And often a single historian who takes a new view of a period claims before the public to represent the body of modern historical opinion, whereas he only represents himself.

But with these provisos and warnings, I believe that the layman can get much instruction and food for thought by attempting to follow the modern variations of the "judgement of history." Upon the whole, if he is not led away by every untried wind of new doctrine, but chooses the most authoritative modern historians as his guide, there is a probability on the average that their views will be nearer to the truth than those of fifty or a hundred years ago, because they are based on a very much greater number of ascertained facts, and because they are, at least in the case of the best historians, the outcome of collating the views and knowledge of a great number of students and writers past and present.

On the other hand, the great historians of previous generations, whose works and reputation have survived by their merit, are much better worth reading than inferior works chosen for no reason save their newness. When great intellect or great literary art has been applied to an historical subject, it is unlikely that any later work on the same subject will be of equal value, until an equally great man arises to deal with it anew.

A perception of this truth is fortunately growing in historical circles, and more particularly in the educational world on its historical side. The idea that a modern text book is more valuable than a great history that is "out of date," is now perceived to be perverse and uneducational. Modern historians and teachers are more apt to direct the attention of scholars and readers to the great historians of all ages, and to direct them to the contemporary literature and records of the epoch that they are studying. The close connection of history and literature is to an ever-increasing extent perceived to be of the utmost educational importance. There is, indeed, a "history of history," and to lose touch with the historians of past times is to lose touch with history herself. It is not the custom to neglect the work of the painters, poets

and novelists of the past; to do so would make art and literature a mean and miserable sciolism, without breadth, roots or tradition. And so it is with history.

England has been rich in great thinkers and writers who chose history as their theme. Yet thirty years ago we were being urged to neglect them as being "literary historians" and to concentrate solely on modern "scientific" research after the German model, breaking with our native English traditions. A reaction against this had begun even before the Great War. It is felt today that English history, though part of a cosmopolitan study, has a tradition and character of its own, connected not only with science in method of research, but with literature in method of exposition.

Though history must be based on sound scholarship, it is for the use not of scholars only, but of all men and women who have any care at all for the things of the mind. Its function is to keep our generation in touch with the very different lives of our ancestors. The immense rapidity of social and economic change in our own day makes this more than ever necessary.

Owing to modern inventions, our life is in many of its most important aspects so different from that of our grandfathers that the traditions of our land and many of the best traditions of the world as a whole will be lost in oblivion, except in so far as history and literature can preserve them for us. In our day people are less rooted in the past than of old. The rapidity of invention and economic change, the disappearance of the rural population in England and the terrible disturbance of the War have weakened tradition and the sense of connection with the past.

The study of history and the spread of historical knowledge and of the historical sense will at least do something to make good this deficiency, to restore balance and good sense, and to give people the idea of continuity and evolution in national and human affairs. But this can only be done if history is popularized through education and through literature. It should be an increasingly large part of the national education, in schools, universities and classes, in private reading and in the talk of men.

Modern historical research has, indeed, accomplished marvels. Whole epochs have been resuscitated; civilizations of which only the name remained, and not even the name, have been recalled to light. The detailed knowledge and understanding of more recent history, medieval and modern, have been not less astonishing. Historians have every reason to be proud of these great triumphs. But that just pride should not lead them to forget the other half of their mission, to popularize the results of their discoveries. For without that popularization, their discoveries are of very little positive use.

It is no easy matter, however, to bring the best and truest results of historical study before the minds of large numbers of people who have neither the time nor the wish to follow the processes by which those results have been reached. There is no royal road to the end in view, but there are a number of ways by which it is approached. It is the object of history to link the present to the past, not only in the mind of the student but in the minds of his fellow-men.

DISCOVERING THE UNKNOWN PAST

THE AIMS AND METHODS OF ARCHAEOLOGY, AND ITS RÔLE IN THE EXPANDING AND ENRICHING OF HISTORICAL KNOWLEDGE

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THE power of regarding the past, and of understanding the causes which have produced the present form of affairs, is one of the greatest tests of civilization. The savage may not know even his own parents, and his outlook is only on the bare needs of immediate existence.

Even to those who carry on a considerable system of cultivation and business—like the peasantry of the East—the past of their own lives is merely a series of changes and events that have affected them.

The record of years as they pass begins with the notched palm-stick in Egypt, with the annual driving of the nail into the door-post of the temples in Italy, with the knotting of the cord in America. As soon as a system of picture writing is developed, note is made of the principal event of each year. The growth of records and the power of comparison leads on to the sense of history, to observing why and how changes come about. This perception of change was first fully expressed by Polybius, who, in the second century B.C. recorded all the rapid stages of the overwhelming reconstruction which raised Rome from a petty Italian state to be the mistress of the civilized world. Since then, for a couple of thousand years, the written record has been taken as the sole means of understanding the past, and Dr. Johnson summed up the position in saying that we could never know more of the ancient Britons than was stated by ancient writers.

Side by side with the written record there grew up some regard for contemporary objects—coins, inscriptions or vases—which might serve as illustrations of the writings. Their value, however, lay in explaining past history rather than in adding to it.

The first expansion from this too narrow view took place in the half century after the Rosetta stone and Persepolis inscriptions came to our knowledge. The past was now no longer to be bounded by classical or Jewish writers; the original documents of an older world opened before us; thousands of years became as yesterday in the presence of the actual words of those ages. This expansion, though purely literary, has yet scarcely taken its place in modern thought.

The days are yet within living memory when no one understood the meaning of remains from unrecorded ages. The first wide expansion of our view came in about 1860, with the recognition that human abilities and thought had grown up in far distant periods, under different conditions and climates, and yet that Man's works could be made a part of the general record of our species.

We realize there are new ways of learning the past; we begin to think in facts and objects rather than solely in writing. The perfection of material treatment in the Parthenon affects our views of the ancient Greek as does a poem or an oration. The Colosseum impresses us as much as the record of the Roman plunder of the world. The statue and gem are accepted as revealing what we would never otherwise know of the nature of the men who demanded them, and of those who made them.

This mode of appreciation requires experience and training. An unpractised judgement is little more than ignorant imagination. The modern step of intimately realizing a work of art or a more mechanical triumph, and the power

of thus entering into the mind of the past, is as great a step as the establishment of language to bring minds into contact, or of writing to convey thoughts.

The study of Man's past is an Art; it requires the power of insight, of imagination, and of identification with the standpoint of a different world. We no longer stand in an age apart, merely wondering at the strangeness or beautv of a work; we have learned to feel it as if we were ourselves listening to the worker, as if we personally shared in his success and gloried in his greatness.

But though this study is an art, it needs to be based on precise information and must be treated as a science, in order to interpret all that is found and to read from it the evidence of knowledge and abilities, of the relation of peoples, or the order and development of the stages of Man.

Most extensions of our knowledge are gradual, but five entirely new ideas have come into our ken in the last hundred years. These are: spectrum analysis, showing the constitution and movement of the stars; microscopic sources of disease, showing the cause of plagues; the world-wide diffusion of electro-magnetic waves; the structure of the atom; and the reconstitution of the past history of Man entirely from the evidence of his material remains.

Archaeology takes its place as one of the great expansions of thought which have been quite unforeseen, working a permanent change in the sense of possibilities.

In the study of Man's nature we must always proceed from the known to the unknown. Recorded history serves to show the method of its changes, and these can be traced back in outline to remote ages. The type of all known civilizations is, first, an invasion of an energetic people and a slow mixture of race with the earlier inhabitants of the land; after some centuries the united race blossoms in successive periods of architecture, sculpture, painting, literature, mechanics and, finally, wealth. Decay then sets in, which is cut short, sooner or later, by a new people entering the country. The whole cycle occupies about fifteen hundred years, but was slower in action in earlier times. Not all of this sequence of activities

TWO STAGES IN THE GROWTH OF THE CHRONICLER'S ART

A notched palm-stick (left) was the earliest Egyptian device for recording the passage of years; indeed, it became the hieroglyphic symbol for time-reckoning. But so soon as these hieroglyphs were invented the chronicler had a wider scope, and as early as the Fifth Dynasty we find annals of the preceding reigns engraved in stone. This fragment of the Palermo Stone (a black granite slab, dating from the Fifth or Sixth Dynasty, and now in the Palermo Museum, Sicily) records the building of ships and the capture of booty under King Sneferu (Third Dynasty).

could be expected in a barbaric state, but the general type, less specialized, is to be looked for in all ages.

We should now consider the different kinds of evidence that we have, for lack of written record. The most direct and decisive standards of age are the actual positions, in an excavated settlement, of one kind of work over another. In digging down through the mound of London, for instance, there are found traces of the Great Fire; below these, Tudor and Plantagenet things, Norman wattle-and-daub houses, perhaps a Saxon foundation, Roman pavements twenty feet down and still lower, British remains. This is typical of town sites, and mounds may increase up to eighty feet or more in height, entirely formed of layers of ruined houses, in countries where mud brick building is usual.

This continuous accumulation, in known historic times, shows how we are to understand similar accumulations which extend into earlier ages, such as twenty-six feet of settlements beneath the oldest palace of Knossos, a hundred feet of mounds in Turkistan before the Roman age, and at Susa fifty-four feet before 4500 B.C. In the same way the relative order of the prehistoric Egyptian periods is absolutely proved by finding them all in one settlement, superimposed one above the other. To elucidate yet earlier ages, the same kind of observation is applied also to stratified beds of sands and gravels, each of which contains a different set of forms of flint implements. These, and the periods to which they belong, are named from the principal place in western Europe where they have been found, thus (approximate dating by H. J. E. Peake and Sir Arthur Keith):

	Peake	Keith
CAVE PERIOD		
Magdalenian	6500	10000 B.C.
Solutrean	9500	13000 "
Aurignacian	11000	15000 "
Mousterian	13000	20000 "
RIVER DRIFT PERIOD		
Acheulean		40000 B.C.
Chellean		80–120,000 "

The recent estimate of date by Peake is drawn from all available facts, but that of Sir Arthur Keith shows that the time may be longer rather than shorter.

Besides observing the piling of settlements one over the other, we read back to remote times by noting the changes that have occurred in the condition of a country. The raised shore-lines around the coasts are brought into connection with human history by the shell-heaps of shore-dwellers at what was formerly the seaside. The reverse of this process is shown by the submerged forests round the coasts of Britain. Deep cuttings have proved that there was a land surface about sixty or eighty feet below the present sea until about 3000 B.C.

A former elevation of the land is proved by the "deeps", or old river beds, at the bottom of the English Channel and in the North Sea; still greater submergence is seen on the North American shore, where the line of every great river has a continuation in a deep valley of the sea-floor five hundred feet below water level. Lesser changes, with reversal, took place after the third century at Pozzuoli, on the Bay of Naples, where land has sunk at least twenty-three feet and been raised again; and at Alexandria, where the coast has sunk about forty feet and been raised again eighteen feet since the Roman age.

The cutting down of rivers also reveals much of early ages. Thus the Thames valley has gravels, with skeletons and implements embedded, left by the river at levels from a hundred feet higher down to the present. Elsewhere, rivers have worn out caves in their sides, as at Mas d'Azil, in France, where, since Magdalenian man, the river has cut down seventeen feet, and at Krapina, in Croatia, where the river has cut eighty feet of sandstone, probably since the Mousterian age. A converse action is seen in the Nile, which dries up owing to running twelve hundred miles without a tributary. The bed, therefore, rises all over Egypt between four and five-and-a-half inches in each century.

An entirely different action is the attack on cliff-coast by wave action. Wherever a coast is of sand, clay or chalk, it is steadily in course of being cut away, and this may remove a mile of land in four centuries, as at Cromer and Dunwich on the east coast of England. The islands which Ptolemy records between the North Foreland and Belgium

have been entirely washed away. The action would be slower on limestone cliffs, yet in Malta there are tracks, leading down to the cliff-edge of estuaries and continued on the opposite side, which were apparently made before the present conditions appeared. The traditions of continuity of land across present arms of the sea are therefore credible, and some idea may be obtained of the length of time involved in the change.

Climatic changes are of much value for relative dating as they serve to link together different places in contemporary periods. The level of the snow line, and the height at which different trees can grow, mark out the past temperatures wherever they can be traced. Closely connected with climate are the various animals and plants belonging to hot or cold, wet or dry conditions. The animals are often of species now extinct, so that a scale of periods can be formed from the grouping that is found. We now turn to see how much is revealed by the work of Man himself.

Changes among us go on in dress, furniture, handwriting, gardening and every form of activity. The date of a book of the last century may be guessed, from its print and binding, within an average of three years.

Such continual variation of taste is not a modern product. If we refer to a continuous dated series, such as the coinage of Rome, the differences every twenty years can be identified. In Egypt the periods, when there is enough material known, can be separated, reign by reign, according to the style of their artistry.

When we look farther back, the habit of change is still seen. One of the longest histories of a form of art begins about 8000 B.C. in Egypt, when a globular pot with ledge-handles was made. This was narrowed till it became a cylinder by 6000 B.C.; the cylinder shrank to a little conical pot at 5000. Copied in alabaster at 4000, it became splayed top and bottom and had a narrow waist by 3000, lastly appearing in

3,000 YEARS OF CHANGE: THE HISTORY OF AN ART FORM

Arguing from variations in style of assignable date, the archaeologist can classify the undated ages of prehistory. Pottery is the most useful index, and from the progressive alterations in its form a series of "sequence dates" may be constructed for the peoples who made it. The sequence above illustrates the degeneration in Egypt through 3,000 years of a globular jar into a little conical pot for ceremonial use only.

rough form for ceremonies at 1200 B.C. Such a continuous chain of variation, by almost imperceptible degrees, serves to divide a long period by its stages.

[While immaterial to the author's arguments, it should be pointed out that the dating of Egyptian history which Sir Flinders Petrie uses follows in the main the statements recorded by the Egyptians themselves, whereas other writers prefer to adopt a later scale of dating. Readers may arrive at an approximation to the shorter system by subtracting from the Egyptian dates given in this chapter an average of about 1,800 years from all dates preceding 1580 B.C.—EDITOR.]

Thus the material from a long stretch of prehistoric time can be reduced to a regular continuity, so that each form is a link between others. When this is accomplished the whole row can be cut up into stages in a numbered sequence, one after another. Thus a "sequence date" is reached by which every stage is distinguished. The hundreds of varieties of pottery can then each have its limits of age, such as sequence date 35–43, as truly as we can date a full-skirted coat to A.D. 1690-1750.

The habit of thought of early races was on regular lines. Certain stock types having once been adopted, only small variations were made on these, while the type itself lasted beneath the changes. Hence each of the chief ages of the flintwork had its distinctive tradition. The immensely long periods left time for the spread of an idea, and it was only very gradually that Man emerged from the fixed stage of his forerunners and became accustomed to change, to grow mentally, to benefit by the experience of others. Perhaps a thousand years of Chellean Man equalled a lifetime of the lake dwellers, or a few months to-day, in the proportionate increase of ideas.

Yet the nature of Man alters very slowly; his changes are in the extent of knowledge, the spread of thought and the utilizing of Nature. But the attitude of mind, the sense of right and propriety, the admiration of truth and accuracy, were the same in Egypt six thousand years ago as among us now.

As life became more full of ideas, so the diversity of thought increased. In the earliest ages almost the same form is found to have been made over thousands of square miles. Later began the differences of work between countries; then the parts of a country varied; in medieval times the cities had their own styles; and in modern times individuals seek "self-expression." In this growth of diversity each country acquired a distinctive style, which is a means of tracing movements of culture or of peoples.

In early Egypt pottery, both in design and color, is closely akin to the modern Algerian. The pottery of the Bronze age in England is equally found on the Rhine, from which the makers appear to have come. Similarly, in historic times resemblances are of value. The great tombs of the Ninth and Tenth Dynasties in Egypt are unlike any earlier examples there, but are on the plan of temples in Nubia; the royal tombs of the Eleventh Dynasty are wide courtyards with chambers in the rock around, and so are the present dwellings of the southern Tunisians. Each of these instances indicates the origin of a ruling family of immigrants.

The distinctive styles of different countries are, then, the labels of their influence, either through objects brought by trade, or through imported ideas, or through immigration of race. Each country had and has its own styles; there is the flamboyant outline of Italic work in the Etruscan age, similar to Hungarian and Persian; there is the curved interlacing belonging to Gothic art, which came into classical mosaics and wicker screens in nomad tents, as among the Kirghiz.

The angular interlacing comes from Justinian's capitals, and began from the Lombards, copied thence in England. The spiral pattern may have started from tree branches, as carved in Malta; it was probably European, as it lasted on to Roman times in Ireland, but died out in Egypt about 1300 B.C. It was turned into a square fret, or key pattern, which appears full-blown in Egypt of the Tenth Dynasty and as the familiar border-decoration of Greece more than two thousand years later.

Beside specific designs such as these,

there is a general style which clings to each land, depending on the sense of form which prevails. This persistence of taste extends to an astonishing conservatism in national forms. The Egyptians had a dozen forms of tools which were unknown elsewhere; on the other hand, there were a dozen forms in other lands around them which were better, yet which were never copied. Such resistance to new types prevents our supposing that arts and ideas were easily spread from country to country.

A great help in early history is given by the various portraits of races. Happily the Egyptian had a taste for observing foreigners, and at the beginning of recorded history there are more than half a dozen different races shown. In the Greek and Roman period the coinage of outlying provinces preserves authentic and dated portraits.

When we find standards of weight the same in very different countries, there is evidence of trade or race connection. This links China, India and Etruria, and gives a glimpse of a central Asian culture. So, too, with units of measurement.

The very fragmentary view that we have, as yet, leaves difficulties in settling how much cultural similarity was due to development in each country, how much due to trade and borrowing and how much to movement of peoples. Some clear examples of re-invention or independence may be listed here:

In Egypt the earliest native ships and the invaders' ships were of different forms, and must have been independently invented.

A paddle-wheel, to drive a ship, is figured in A.D. 527 on Roman carving. This cannot have started the use of it in 1789 in England.

The power loom, weaving five or six webs day and night, was in use in Danzig and destroyed by trade jealousy before 1660. It was slowly re-invented in 1785 by Cartwright.

Silver and bronze pens were used, rarely, by Romans; these are not likely to have been the origin of our modern steel pens.

The hydrometer was re-invented in 1600; only later did Synesius' description of it in the fifth century become understood.

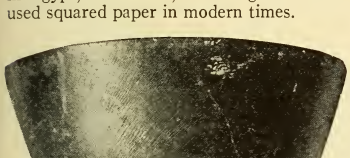
Block print stamps, with the name of

RACES THAT MOULDED THE UNWRITTEN HISTORY OF EARLIEST EGYPT

The efforts of the Egyptians towards accurate portraiture are of immense help to the archaeologist in enabling him to trace race movements. These markedly different heads are very ancient Egyptian stone-carvings: 1, predynastic Egyptian; 2, Arabian; 3, tributary of invaders; 4, Syrian; 5, invader (from the Taurus?); 6, Egyptian chief; 7, dynastic conqueror; 8, dynastic general.

a Ptolemy, were used to mark duty-paid papyri; these can hardly have started Chinese block-printing much later.

Squared papyrus for plans, of 1400 B.C. in Egypt, was found, after engineers had used squared paper in modern times.



The earliest glimpse of anything like civilization which Egypt affords to the archaeologist is the Badarian, so called from remains first found at Badari near Assiut in Upper Egypt. Though hand-wrought, the pottery is harder and thinner than any ever afterwards made in the land.

Seven independent systems of writing have been separately invented, in Babylonia, Asia Minor, Egypt, the Mediterranean, Crete, Mexico and Easter Island.

The use of a testing plane, or "facing plate," in working planes true was known in Egypt in the Fourth Dynasty, and reinvented in the nineteenth century.

Mirrors of plane, concave and convex forms were invented in America before the European invasion.

Cork soles for shoes were used by the Romans, and have been re-invented quite recently.

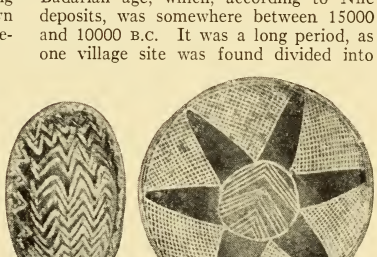
Knitted wool socks, with separate great toes, were used by the Romans; knitted stockings were re-invented in the sixteenth century, separate toes in the nineteenth.

It is familiarly known how often various persons, at the same time but quite independently of each other, devise the same invention. It is therefore to be expected that similar ideas will also occur at long intervals. The above cases are examples of such recurrence. Where there is obvious mechanical utility in any idea, it is likely to be revived again as often as it is forgotten. But where an artistic form or design occurs, there is no constant stimulus to reproduce the same idea. Hence artistic resemblances are good evidence of descent.

We have now glanced over the alphabet and grammar of material history, and it remains to sketch what is the view of the past which is recovered by these means. In place of thinking that nothing was possible but what we happen to know, we now look on our discoveries as being only limitations of the possibilities of history.

Egypt provides the most completely known example of the rise of a civilization. The earlier Palaeolithic works of Chellean and Acheulean flint are found lying on the surface, and both are found in different levels of the granitic gravel, which belongs to the period of the great rainfall that scoured the eastern mountains. The earliest stage of cave-man work appears with Mousterian flints in the limestone gravels, and, later, exposed on the surface settlements.

The beginning of a continuous view of Man in one place is seen in flint work of Aurignacian type—perhaps 15000 B.C.—which underlies others of Solutrean type at Badari in Upper Egypt. The full view of civilization begins with the Badarian age, which, according to Nile deposits, was somewhere between 15000 and 10000 B.C. It was a long period, as one village site was found divided into two by a layer of hard concreted rubble, of slow formation.



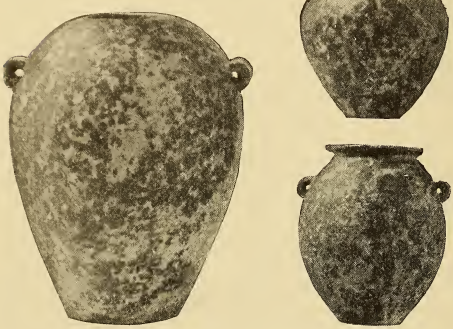
Next to the Badarians upon the Egyptian stage came the Amratians. They took over many of the arts of their predecessors, but introduced the novelty of painting their pottery. The designs are copies of basketware, and it is significant that similar work is done today in the Algerian hills.

The people were skilled in delicate work in flint; they executed the finest hand-made pottery, thinner, harder and more polished than any of later and historic times. They were carving ivory

and modelling pottery figures in a natural and capable manner. They glazed stone beads, spun thread and wove, cultivated corn and stored it, carved ivory combs and used germicide eye-paint. They were thus much above the present races whom we call barbarous.

The restoration of this people to our knowledge depends entirely on the layers of their remains which underlie the other civilizations, and the levels at which their works are found, in relation to the Nile. It is clear that they were decadent in Egypt—their earliest remains there are the best. As such flint work is known in Palestine with shells from Suez, we must look on them as emigrants from the north. The flint work is closely like the European Solutrean work, perhaps of the same age, and that is known to have come west from the north side of the Black Sea; so we are led naturally to look to the Caucasus as a possible center of this civilization.

Now, that region has been noted as being very like the Land of the Dead, or paradise, as described by the Egyptians; very fertile, yet with lakes of fire and high mountains. Such an account agrees with the Caucasus valley, and nearly all the names of places in the Egyptian mythology are found in that country in their true connection.



It is their pottery that chiefly distinguishes the races which followed each other in the dim prehistory of Egyptian civilization, and these examples of the three earliest show that there is no mistaking one for another. The Gerzeans, who followed the Amratians, wrought in the hardest stone, and produced entirely by hand vessels of such perfect shape as the porphyry vases immediately above.

The Badarian civilization faded in Egypt, and the land was overrun by invaders; as they are best known at el-Amrah, they are termed Amratian. They seem to have come from the west, as their decoration of pottery with basket pattern in white or red, in the same designs, survives in the mountains of Algeria. The Amratians took over the arts of pottery, ivory work, carving of figures, glazing, agriculture, weaving and eye-paint from the earlier folk. But they had fresh ideas, such as the painting of designs on pottery, new forms of flint work on a larger scale, the use of rowing boats or galleys and a small use of copper; also the personal customs of shaving the head and wearing a wig and sandals. The succession of these people after the Badarian is proved by the layers of their settlement, and the immediate connection is seen by the carrying on of many ideas. Perhaps about 10000 to 8000 B.C. may be their period.

From the east there came a third civilization, overlying the Amratian; this, being found at Gerzeh, is termed Gerzean. This was more advanced; large shipping came into use and trade extended to Europe. Copper was usual for small tools; gold and silver appear. Flint working was developed more highly than in any other age. Vases of the hardest stones were finely wrought. Pottery was commonly painted, often with figure subjects. Emery, lazuli and, rarely, glass were brought from Asia. There was some northern connection, as a figure of an elk was carved on slate. Games with pieces came into fashion. The use of linear signs, or property marks and badges, increased. The country was united as the same types of pottery and decoration are found over the whole of Egypt and even as far afield as Nubia (the Sudan) in the distant south.

This civilization lasted from about 8000 to 6000 B.C. and then collapsed suddenly. All the finer products disappear, the pottery and flint work become poor, trouble increased with invasions by the "dynastic" race, and also from the south and from Asia.

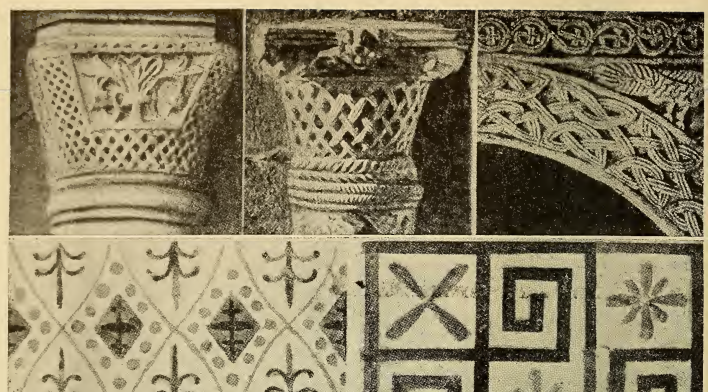
The fourth civilization was that which grew into the united kingdom of the First Dynasty. This movement extended over several centuries. There was a great confusion of peoples, eight different races being figured as fighting in this period.

The dominant power was possibly a trading people from Elam, who came down the Persian gulf, round Arabia and up the Red Sea. They brought many of the ideas of Mesopotamian culture: the use of panelled wooden houses, high numeration to millions, the beginning of hieroglyphic writing, the use of cylinder seals, an abundance of copper for tools, fine portraiture in ivory, pottery of large size and fine material, and glazing for tiles and faience.

Writing soon became usual, and precise annals were recorded of the principal events of each year, the height of the inundation and the day of accession and death of each king. Foreign pottery was often imported, both from Syria and from Crete. After the middle of the First Dynasty decay is evident.

The fifth civilization was due to an invasion from the south; a conqueror, of Sudani features, founded the Third Dynasty, and many entirely new ideas entered the country. This new movement culminated in the vast schemes of Khufu. With him the lines of Egyptian growth were established; and the course of events became the subject of the written record.

The latest discoveries in the unknown past have brought Asia into closer relation with Egypt. The fifth civilization fell into decay, and was overrun by a people from the Caspian: their source is shown by the identity of ornamental pins and daggers in the Caucasus and Egypt about 3000 B.C. Another invasion, marked by the same style of pins and daggers, was that of the Hyksos, about 2000 B.C. These migrations add weight to the evidence adduced in the previous page to the effect that the place-names in the Egyptian mythology come from the Caucasus. Six migrations from that region, moving south on Egypt, can now be traced down to the time of Saladin in the 12th century A.D.



The valuable deductions made from the design of historic ornaments emphasize the importance of the variations which we may find in the style of prehistoric work. Thus, the Gothic capitals above, from Venice and Rome, are derived from nomad wicker-work, and the interlacing tracery from Ravenna (right) comes from the angular rush-work of Lombardy. The lower pictures above show the spiral and palmetto motive (left) and the later 'Greek' key pattern, used together on the same ceiling of a Tenth Dynasty Egyptian tomb at Qau.

An obvious index to the origins of a civilization in historic times is to be sought in its coinage, and above we see a range of coins which give a useful idea of contemporary history. They portray (from the left): A British horse; a Spanish horseman; a palm tree; King Sauromates of the Cimmerian Bosporus; and a tartar of Afghanistan. The lower pictures show the two types of ships employed by the contestants in a battle portrayed on a carved knife-handle from Gebelel-Arak, suggesting to the archaeologist a notable example of independent invention.

CULTURAL INDEXES OF SERVICE TO ARCHAEOLOGY

Before History Began

EARTH AND ITS INHABITANTS IN THE PREHISTORIC ERA

Short Survey of This Division

CHAPTER 1
The Birth of the World—*Sir J. H. Jeans, D.Sc., LL.D., F.R.S.*

CHAPTER 2
The Making of the Earth—*Prof. J. W. Gregory, D.Sc., F.R.S.*

CHAPTER 3
Life on Earth Before Man—*Prof. D. M. S. Watson, F.R.S.*

CHAPTER 4
The Evolution of Man—*Prof. Sir Arthur Keith, M.D., D.Sc., LL.D., F.R.S.*

CHAPTER 5
The Primitive Community and the Origins of Races—*Prof. H. J. Fleure, D.Sc.*

CHAPTER 6
Primitive Crafts in Peace and War—*R. R. Marett, D.Sc.*

While the aim and scope of this division of our work will be gathered at a glance from its title and the subjects of the chapters it comprises, it may be mentioned that, in common with the succeeding section, it is offered as introductory to our History proper. The chief characteristic of this work is its continuous narration of world-history, presented in a sequence of Chronicles, each accompanied by a group of Studies or interpretative chapters wherein authoritative writers seek to recapture something of the spirit of the times under review, to examine and expound the principles that underlay the events narrated. But in this introductory division we are mainly concerned with an effort to acquire a knowledge of the stages whereby mankind was evolved upon the Earth and the sort of life that men led in the dim immensity of time preceding the dawn of history; and for this we study primitive peoples still surviving whose manners and customs offer clues to those of prehistoric man.

INTRODUCTORY TO OUR GROUP OF STUDIES IN PREHISTORY

History is the history of Man, of his actions and his thoughts. In the days, not so far distant, when one single act of creation was held to have brought man and the Universe simultaneously into existence, it was possible to write an apparently reasonable history of mankind that took no account of the other 'histories,' of natural history or astronomy or geology, or of that still more recent science called anthropology.

Today our whole outlook on these matters is profoundly altered. We now know that for millions of millions of years this universe of matter, a mere handful of whose brighter bodies star the sky at night, was evolving before our tiny world was born—an event of yesterday in stellar history; that our Sun is just a small star among the stars; that even compared with the Earth's brief story the life of Man upon it is like the last few seconds of a long day; and that only during about a fiftieth part of his existence has Man been leaving conscious records.

Scope of our First Division

With this knowledge it would be indefensible to embark upon a Universal History that ignored the universe—to narrate man's intricate reactions to his kin and his environment without making some attempt to describe the vast stage upon which he has entered as such a newcomer. And then there is Man himself. Can it be reasonable to pick up the story of this most baffling creature at the moment when he began to make records, without first inquiring what he is?

This work is, therefore, no less rigidly a history of mankind because its first section is devoted to matters that do not find a place in most histories.

Now in the body of our History the ordered sequence of events is given in 'Chronicles' and their interpretation in annexed chapters. Here, at this primordial stage, no such division is possible; but since the matters discussed in the following six chapters are of some complexity, it will be advantageous to start by defining the ground covered and presenting in a clear outline the answers given by modern science to the problems that affect us. And that is the object of the present Introductory Survey.

Mysterious Beginning of Things

This opening section, then, contemplates no exhaustive resumé of the various sciences involved; they are called in to answer certain definite questions only. What is the Universe, its age and extent? What is the Earth and how did it come into existence? How did life arise and spread? What is Man and through what changes did he evolve? Lastly, how was Man behaving during the centuries before he stands out in the clear light of his own records? Not all these questions can be answered with the certainty to which we are accustomed in the affairs of every-day life.

No limit, for instance, can be set to the age of the Universe. It is impossible to imagine a distribution of matter and energy that might not have had an antecedent stage of development. But such marvellous strides have been made by astronomy that to-day it is possible to suggest a round number of years during which the oldest star *visible to us* can have existed as a star. The figure is 200 million million; and on this scale our Sun would be between 7 and 8 million million years old.

Before the longer period, it seems, every star that we know must have been

part of a nebula. Thousands of these clouds of tenuous gas may still be observed scattered through the heavens, at all stages of what appears to be a slow but progressive and universal development; and in Chapter 1 Sir James Jeans shows how the patient comparison of one with another leads to the conclusion that they are shrinking, rotating and condensing, and that a colony of stars is the ultimate product of each.

Are planets, such as our Earth, born from stars in the same manner? So it was once thought, but physical facts do not support the view. According to the theory expounded in the second half of Sir James Jeans' chapter a star acquires a family of planets, not slowly and inevitably, but by what is probably a rare and sudden accident—the near approach of another heavenly body that by its gravitational pull drags the planets out of the body of their parent. Such a catastrophe once happened to our Sun.

How long ago this event took place it is impossible to say with exactitude; but as radioactivity demands at least 1,500 million years since the solidification of the Earth's crust, and as there is reason to think that this process did not take long (on an astronomical time-scale), perhaps an estimate of 2,000 million years would not be far wrong.

Life's First Emergence on Earth

Vast figures like these convey little by themselves; let it be said then that, compared with the age of the Sun given above, the age of the Earth is as the length of the last brick in the last house in a street more than half a mile long. Even to realize this, it is necessary to think consciously of a familiar street and then gaze at a brick wall.

From the moment of the appearance of life on the Earth we can trace its evolution with some approach to certainty; how it appeared is still a matter for conjecture. But a surprising amount of most interesting facts bearing on the question has been accumulated by chemist and biologist, and some of this material is laid before us in Chapter *2*, where Professor J. W. Gregory traces the history of the Earth through the great epochs of its development.

These divisions of geological time are grouped into four eras, for which varying names have found acceptance. As considerable confusion often results, the two schemes of nomenclature most commonly in use may be set side by side, with the meaning of the second in a third column:

		Era of:
Archaean	Pampalaeozoic (or Eozoic)	Primeval Life
Primary	Palaeozoic	Ancient "
Secondary	Mesozoic	Middle "
Tertiary, Quaternary	Cainozoic	Recent "

Epochs of Geological History

The first set of terms applies more specially to the types of rock, the second to the living species that characterize each Era; but they are interchangeable, and indeed there is little valid distinction between them because of the number of rocks that owe their origin to organic agencies. These agencies have usually been lowly forms, of types that still provide by far the greatest quantity of living matter in the world to-day, though they were the first of all to evolve. Hence they are inseparable from the subject matter of Chapter *2*; but with the emergence of backboned animals in the Palaeozoic Era the story of that progressive minority, the higher forms of life, is taken up separately in Chapter *3* by Professor D. M. S. Watson.

In the meantime, however, while species were multiplying, growing, flourishing and dying out, or else evolving into more complex varieties, the great processes of earth-building were still going on. The crust was shrinking and folding, mountains were being upraised and planed down again by water and wind and ice, continents rising and sinking. And if stress is laid in Chapter *2* on the formation of those minerals that were eventually to prove of use to mankind, this is the function of the work and should not be held to involve the question of a design in nature, which is outside our scope.

The Upward Urge of Life

In rocks of the Palaeozoic Era the earliest fossils are encountered. First they are of low, shell-fish forms that had adopted a stony armor to protect them

against carnivorous foes, then of horny-coated crustacea, the trilobites. Next on the upward ladder came the fish, with a backbone and internal skeleton. It was one group of these which, forced from the shrinking lakes by a long epoch of drought, developed lungs and limbs and so evolved into the amphibian inhabitants of the great Coal Forests.

Momentous Changes of Living Forms

THE same climatic change that blotted out the rank vegetation of these forests probably stimulated certain amphibia to take the momentous step of severing their dependence on water and becoming completely terrestrial. At any rate there were reptiles on the Earth before the close of the Era of Ancient Life, though their great age of ascendancy was the Era of Middle Life when monsters of all shapes and sizes were undisputed masters of every element. In the same way mammalian forms had actually evolved at the beginning of this middle era, though they were of little account until the reptiles vanished with the dawn of the Era of Recent Life.

The world now began to assume a vaguely familiar appearance. The outlines of the present continents took shape, though there were many land-bridges where to-day is sea. Indeed the degree of resemblance to modern conditions has provided the names for the periods into which this Era is divided, so that we speak of the Eocene, Oligocene, Miocene and Pliocene periods, implying the 'dawn' of modern conditions, little modern, not very modern and more modern; while the Pleistocene, meaning most modern, is regarded by anthropologists as the first period of a new Era called the Quaternary, whose second period, the Holocene or entirely modern, includes to-day.

Ancestors of the Human Race

QUITE early in the Era of Recent Life there emerged a group of little creatures in which we take a pardonably exclusive interest, for they were probably the ancestors of some hitherto undiscovered ape that in its turn gave rise to the modern anthropoids and to Man himself. They are known as the Tarsioids—their living representatives are the tarsiers—and the evidence for their distinction, and for the descent of Man, is set forth in Chapter 4 by Sir Arthur Keith.

The intermediate ape has so far yielded no certainly identified fossils. Not so primitive man. We now have remains—crania, thighbones, teeth—dating back to the late Pliocene and early Pleistocene, and belonging to creatures that walked erect and had a brain capacity far larger than that of any known ape. Whether mankind to-day, admitted to form a single species (Homo sapiens), is directly descended from these early types is highly doubtful.

Human Species now Extinct

WITH a later group the question of species, however, becomes more acute. Between these earliest bones and the first men who dwelt in caves, and whose remains are therefore preserved in fair numbers, there stretch aeons of time represented by strata that yield flint implements of primitive manufacture. Their makers dwelt on the drifts beside river margins. But when we come to the cave men we have to deal with creatures whose humanity is undoubted and whose intelligence must have been of a very high order. It is nevertheless stated that they were a collateral, now extinct, offshoot from the human stem, constituting a separate species called Homo neanderthalensis, from the Neander Valley near Düsseldorf where they were first found.

But before taking up the story of Homo sapiens it were well to glance back at two separate questions hitherto ignored because of the difficulty of giving anything like positive answers. What time-relation do our four geological eras bear to the 1,500 million years postulated for the age of the solid Earth, and how long ago did Man evolve? Secondly, can any reason be given for his intellectual climb out of the ruck of the other mammals?

Arguing from the thickness of strata geologists are inclined to say that the Primeval Era must have lasted four times as long as the other three put together, the Palaeozoic half as long again as the other two, and the Mesozoic more than three times as long as the Cainozoic. If we allow 30 million years for the Cai-

nozoic, this just accounts for our 1,500 million; but it must be admitted that some scientists, more especially the zoologists, are only prepared to give the Cainozoic two million—which is the sort of discrepancy that must be expected in the present state of our knowledge.

Sir Arthur Keith adopts the lower figure; so that as the oldest discovered human remains are referred to late Pliocene times, Man is on this basis *at least* 300,000 years old. Moreover, as this only takes us back a short way into the Cainozoic, the estimate would serve almost as well on the longer reckoning.

Now the Earth towards the end of Pliocene times underwent what is known as a glacial epoch. The ice-caps spread outwards from the poles, the mountain ranges were laden with snow and great glaciers ground their way down the valleys to cover the plains with ice. Much of Europe then experienced Arctic conditions and Pliocene man vanished.

When Mankind Lived in Caves

THE Ice Age, however, was not a homogeneous phenomenon. Several times throughout the Pleistocene the ice advanced and retreated, with quite clement conditions in the intervals. The first long warm interval was the great age of the drift-dwellers, as we can tell from their flint implements; but during a subsequent glaciation we find a group spreading into Europe along the borders of the ice and apparently acclimatized to cold conditions—the Neanderthalers already mentioned. They were presumably drift-dwellers who had learnt to combat the rigors of the cold by taking to caves and making fire. May it not be that the Ice Age, with its stimulus to invention and adaptation, is responsible for the great intellectual advance of which the Neanderthalers are the earliest example?

Of course, these changes of climatic environment must have had suitable material to work upon. No other mammal was thereby stimulated to a progress comparable with that of Man, who for ages had used stone weapons and could probably already speak. In Chapter 4 the subject is fully discussed.

It was in a warmer period, after the worst of the Glacial Epoch was spent, that modern men first came upon the European stage and so enter our ken. They probably spread in successive waves from North Africa and south-western Asia, districts that are now largely desert but received sufficient rain to make them habitable grasslands when the ice was over Europe. Neanderthal man retreated northward before them, with the colder climate to which he was accustomed; or perhaps was exterminated.

First Advent of Modern Men

EUROPE, though no longer Arctic, was still fairly cold steppe-land, with the rigors of a continental climate unmodified by extensive forests; and these new men were cave-dwellers like their predecessors. But they had great intellectual potentialities, and towards the end of their period there was a tremendous outburst of art. Bows and arrows appear, and probably also clothing and artificial dwellings of wood or skins.

Professor H. J. Fleure, in Chapter 5, gives a picture of the life that must have been led by these early food-gatherers. Society was probably organized on family lines, for man seems to have inherited the idea of the family-society from his ancestors the apes, and the older theory of a primitive horde is now no longer held.

The Invention of Agriculture

THE phrase food-gatherers has just been used, and this brings us to the next event in human evolution. Somewhere near the Euphrates and the Nile the discovery was made that food could be produced as well as gathered; in other words, cultivation of crops began. It used to be thought that this was preceded by a pastoral and nomadic stage, but more probably pastoralism was in most cases a secondary accompaniment of agriculture.

Agriculture brought in its train a whole host of other inventions. The arts of weaving and of pottery were elaborated. Stones were ground instead of chipped, and so flint was no longer used exclusively. This interest in other minerals led to the discovery of copper and of its alloy bronze. The necessity of tending the

crops made for more permanent settlements. Villages and finally cities arose, and the advantage of organized work—irrigation, especially—led to the establishment of kingship.

Religion we may also regard as having begun at this stage. Of course, it is largely a question of nomenclature, for there is plenty of evidence for supernatural beliefs among the food-gatherers. But the four elements that seem to make up religion—magic, fear, ethics and a learned priesthood—had not before now been fused.

How Religion first Came to Be

THE primitive hunters believed that Nature could be influenced by imitation—that prey, for instance, could be ensured by representing a successful hunt in make-believe. Hence magic. Misfortune was apt to be connected with anything unusual—thunder, a strange rock—and the weapon of magic used to avert it. But causation implies an idea of will and personality. Hence gods. At this stage magicians and witch-doctors might arise, but scarcely priests. There is reason to think that divinity was only attributed to the more regular manifestations of Nature, such as heavenly bodies, with the introduction of agriculture, and that the gods did not receive human form without the analogy of the kingship or of deified ancestral heroes. Finally, religion was born when the tribal god was made guardian and sponsor of the tribal ethics, which are still completely separable from religion in certain backward races, and no less strict on that account.

The date to which we must assign the invention of agriculture has been one of the most vexed questions among anthropologists. It was once the fashion to throw it back into a remote past; but while modern research has greatly extended the antiquity of Man, it tends to bring agriculture down to comparatively recent times, say 7,000-10,000 years ago.

Meanwhile modern man, still in the food-gathering stage, had occupied the rest of the habitable globe, including the New World. Among his communities there slowly spread the 'invention-complex' of the food-producers, in ever widening circles from the original centers in southwestern Asia and Egypt, favored in her possession of the annually flooded Nile; but communications were bad and Man conservative, and at first there penetrated little more than scraps and shreds.

The spread of the forests, for instance, had caused a period of misfortune to overtake the old homeland of the European hunter-artists. Their cultural descendants still eked out a miserable life on the shores of the North Sea with a diet of shell-fish, while agricultural folk, whether newcomers or not, made way in the clearer zones. But the equipment of these latter did not include the knowledge of metal, only the improved treatment of stone; so that we speak of a Neolithic or New Stone Age, though the term should be used with great reserve except when applied to Europe.

This word, Neolithic, is used in contradistinction to the previous Palaeolithic or Old Stone Age; both are archaeological terms referring to methods of flint-working. As we have seen, a more significant division for historical purposes is into drift-dwellers and cave-dwellers (both food-gathering), and settlement-dwellers (food-producing); yet a proper insight into the successive styles of stone-working is of immense importance, for it is almost entirely on these more durable specimens of his handiwork that we base our knowledge of pre-record man. Thus the subject is given due prominence in the last chapter of the section where Dr. R. R. Marett outlines what we know of primitive arts and crafts.

Beginning of Recorded History

IT was in Egypt and Mesopotamia less than 6,000 years ago that Man first began to leave conscious records, and 'prehistory' came to an end. But there are areas to-day where in all essentials the native inhabitants are still pre-record men. Moreover, in the remotest of these areas they are still food-gatherers, even if possessing stray elements of a higher culture; and indeed so primitive that they may be used to illustrate the prehistory of more advanced races. So that although the stream of our history proper now takes its rise, there are yet backward races of to-day that find their place in this opening section.

THE BIRTH OF THE WORLD

SHOWING HOW ASTRONOMY AND PHYSICS CAN PROVIDE A RATIONAL EXPLANATION OF THE ORIGIN OF THE EARTH

SIR JAMES JEANS, D.Sc., Sc.D., LL.D., F.R.S.
Author of 'The Mysterious Universe,' 'The New Background of Science,' etc.

LEGENDS as to the origin of the world figure largely in the vast body of tradition which is handed down from generation to generation among primitive races. These legends universally postulate a living creator—often a bird, an animal or an old man—and a supply of raw material out of which the creator builds the earth. Often enough the ocean and the heavens are supposed already to be in existence, and the creative act consists merely in making the dry land. Clearly all such legends are formed out of mere "picture-thoughts," the reveries of the primitive mind first confronted with the workings of Nature.

The intense interest which the Greeks felt in Nature resulted in a mythology which was richer, more serious and, it need hardly be added, more artistic. Uranus, the most ancient of all the gods, founded a dynasty in which son succeeded father through three generations, each of which took its share in the creation of the world, until it was peopled with divinities who presided over all natural phenomena.

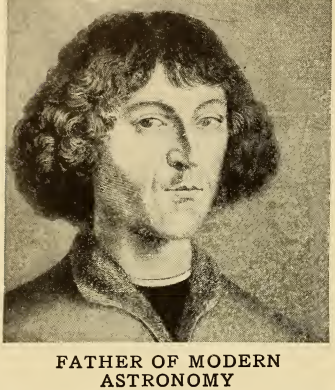
As long ago as six centuries before Christ we find Thales of Miletus discarding this mythology as being too anthropomorphic, and from then on to the time of Empedocles (450 B.C.) there appeared a whole succession of rationalistic cosmogonies, each more complex than its predecessors. In Plato's "Laws" the Athenian introduces the hypothesis that "all things come, have come, and will come into existence, either by Nature, by art or by chance."

The Greeks had no scientific knowledge adequate for the testing of such conjectures; they found one scheme as inherently probable as another, provided only that both ended up with the world as they saw it to exist. Some two thousand years were to elapse before science provided material of real value in cosmogony, and after this some two centuries more before any cosmogonic use was made of this material. All this time the cosmogony of Empedocles, Plato and Aristotle held almost universal sway.

According to their scheme of Nature all matter is made up of the four elements, earth, air, fire and water, which contain the four qualities of coldness, dryness, hotness and moisture. "Nothing comes into existence out of that which is not, but everything out of that which is," says Aristotle, so that there can have been no process of creation, merely a redistribution of the four elements and their four qualities. Circular movement was regarded as the most perfect conceivable, and the sphere as the most perfect of surfaces. Consequently, the earth was supposed to be spherical, and to be fixed at the center of the universe, which was itself spherical; while the planets and stars, attached to various rotating spheres, revolved round the earth in circles. The universe was believed to be finite, its boundary being the outermost sphere, the *primum mobile* to which the "fixed stars" were attached.

One radical defect of this scheme was that it assigned to our world a unique position at the center of the universe, a position which, while gratifying to human vanity, was fatal to scientific progress. So long as the earth was deemed to be unique, it was not much good trying to obtain scientific evidence as to the mode of its birth. If the birth of worlds were as common an event as the birth of kittens, it might be possible to discover how our own world had come into being by watching the birth of other worlds; but a general belief in the uniqueness of our world precluded any such attempt being made from the very outset, even if it had been possible. Further, the doctrine of

the uniqueness of our earth formed one of the essential cornerstones of orthodox Christianity, so that anyone who ventured even to conjecture the existence of other worlds similar to our own was liable to incur the very special displeasure of the Church.



FATHER OF MODERN ASTRONOMY

By no means the first to feel the shackles of orthodox cosmology, but the first to break them was the Polish astronomer, Nicolaus Copernicus (1473-1543).

Nevertheless, we find Nicholas of Cusa, a cardinal and thus a pillar of the Church, writing in 1440: "I have long considered that this earth is not fixed, but moves as do the other stars. . . . To my mind, the earth turns upon its axis once every day and night." That he escaped conflict with the Church which he ornamented was perhaps because it did not yet realize the full implications of his supposition, but those who ventured to follow him in this line of thought fared less well. The last consolations of religion were withheld from his immediate disciple, Pietro Pompanozzi (1462-1525); Bernardino Telesio (1509-1588) saw his writings placed on the Index; while Giordano Bruno (1548-1600), who expounded the implications of the Copernican astronomy when this arrived, was imprisoned for seven years and ultimately burned at the stake, the list of charges brought against him including his belief in the plurality of worlds.

Copernicus himself had escaped conflict with the Church by withholding the publication of his great work, *De Revolutionibus Orbium Coelestium,* until after his death. The first printed copy reached him just in time for him to hold it in his hands before he died, happily too late for him to discover that a preface had been inserted warning its readers that its conclusions were to be regarded as purely hypothetical.

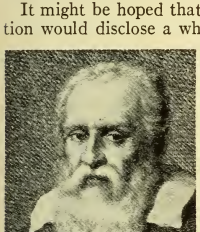
Although Copernicus had slipped beyond their reach, the Church was by now thoroughly alive to the threat which was involved, both to orthodoxy and to its own authority, in any promulgation of Copernican doctrines. The hue and cry was not limited to the Church of Rome; when Luther and Calvin joined in denunciation of the "upstart astrologer who had dared to set his authority above that of Holy Scripture," the two main factions of the Church were at one in their desire to stamp out inquiry after the truth. Yet the terrors of religion, while they may have delayed, entirely failed to arrest the progress of this inquiry.

In 1608 the telescope was invented, and in 1609 Galileo constructed the tiny instrument which is still lovingly preserved at Arcetri. This almost immediately revealed to him the phases of Venus. It had been urged as an objection to the Copernican theory that if the planets revolved around the sun they ought at times to turn almost completely dark faces towards the earth; they ought, in fact, to show phases like the moon. Galileo's discovery, in 1610, that Venus actually exhibited such phases left but little room for doubt as to the essential truth of the Copernican theory. An even more convincing visual proof was to follow almost immediately, for the same year saw the discovery of the four principal satellites of Jupiter.

Galileo's telescope now revealed the fact that even if we could not see the planets actually wheeling round our sun, other similar systems were open to our observation. Jupiter was seen to have a family of satellites circling round him in precisely the way in which Copernicus had imagined the planets to circle round the sun, while Saturn and his family of satellites were observed shortly afterwards and found to conduct themselves

in a similar way. The mere fact that there were at least two such systems in the universe could hardly fail to suggest that they had come into existence through the action of natural laws, rather than through some special arbitrary act of creation. The problem of how the earth had come into being immediately became a suitable subject for scientific investigation, and so was removed from the realms of fanciful speculation or religious dogma. The obvious line of attack on this problem would perhaps be somewhat as follows.

It might be hoped that further observation would disclose a whole series of systems similar to our own. Such systems would hardly have all come into existence at the same instant, so that it might be hoped to find planets of different ages, some older than our earth, some younger, some perhaps still in process of being born. And out of these samples of planets at different ages it might be found possible to construct the life histories of planets and of systems of planets, and so to trace out the past history of our earth.



INVENTOR OF THE TELESCOPE

No confirmation of the doctrines of Copernicus was possible until Galileo Galilei of Pisa (1564-1642), working on the Flemish invention of the magnifying-glass, perfected the first astronomical telescope. Through this minute instrument (right) he gazed with wonder on the phases of Venus.

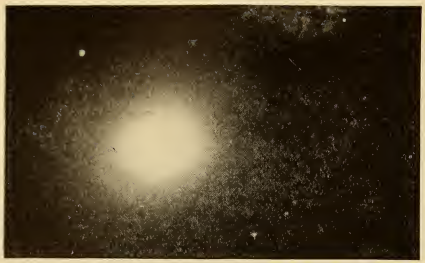
Notwithstanding the vast recent growth of observational astronomy, this hope has not been fulfilled. As we shall shortly see, there are reasons for supposing that the whole solar system came into being almost instantaneously, so that all its planets are of the same age. To find planets or satellites either younger or older than our earth, we have to look to the systems surrounding other stars. These stars, however, are so remote that they appear as mere points of light in even the most powerful telescope, no instrument on earth having adequate power to show a planet as bright as Jupiter circling round even the nearest of the stars.

This line of attack, then, leads nowhere. Our telescopes show no planets or satellites except those of our own solar system, which, having all been born at the same time, provide no material for the study of the life history of planets.

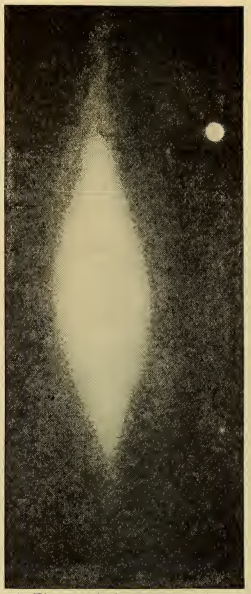
The only method which remains is that of abstract scientific investigation. All astronomical bodies obey the universal laws of physics and mechanics, and if it were possible to give an exact specification of the present structure of any astronomical system, these laws would enable us to trace its history indefinitely in the direction both of the future and of the past. This is the method on which we must even now rely, but before describing modern applications of the method let us examine the use made of it by Laplace when he framed his famous nebular hypothesis in 1796.

Laplace knew little about the sun except that it radiated heat and that the occurrence of sunspots, prominences and such phenomena at its surface indicated that its outer layers at least were gaseous. The general laws of physics suggested that a star which was partly or wholly gaseous could not continue emitting heat without undergoing some change of constitution. Laplace, believing that the emission of heat must necessarily be accompanied by shrinkage, was led to conjecture that the sun had been of greater size in earlier ages than now; he thought of the primeval sun as a huge nebula, or gaseous cloud, extending to some thousands of times its present dimensions.

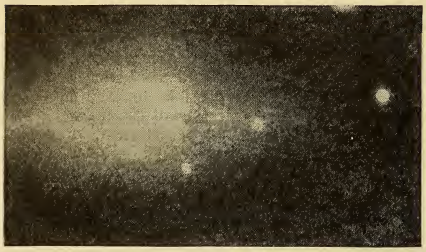
The motion of sunspots across the sun's surface indicates that the sun rotates about its axis once every 27 days.



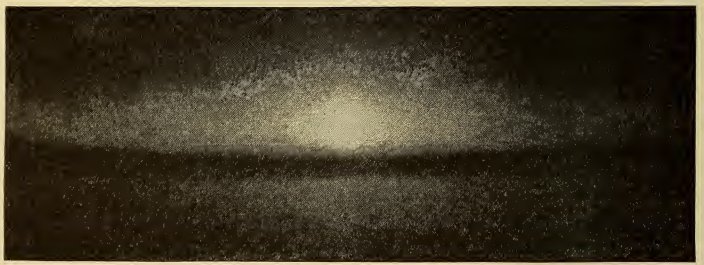
(1) Nebulae, whence the stars are formed, are vast, tenuous clouds of luminous gas scattered through space. In their earliest stages, shown by the one above, they are diffuse and often almost globular. (N.G.C. 4647-9)



(2) These nebulae revolve slowly, but as they shrink under the force of gravity their rotary speed increases. They become flattened at the poles (as seen in Fig. 1) and begin to bulge out round the equator. (N.G.C. 3115)



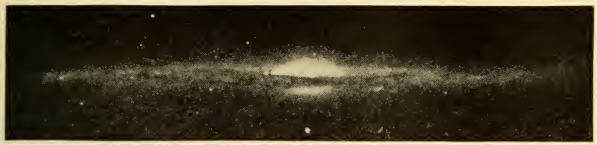
(3) After a certain stage the equatorial 'bulge' can go no further and still maintain equilibrium. Matter is then thrown off by centrifugal force, and can be seen as a dark band across the nebula above. (N.G.C. 5866)



(4) With further contraction and still faster rotation the ejected matter may form a complete ring. In this photograph it is seen surrounding the bright nucleus like a girdle, and, showing darker by comparison, appears to bisect it through the equator. Such is the size of these nebulae that one complete revolution may take millions of years. (NG.C. 4594)

ACTUAL PHOTOGRAPHS OF DIFFERENT NEBULAE, SHOWING

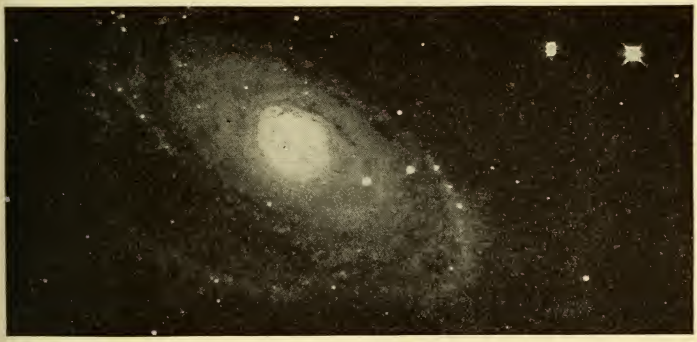
From photographs taken at Mount Wilson Observatory, California. Numbers preceded by N.G.C. refer



(5) A fully developed nebula is shown in the photograph above. Here the nucleus has shrunk so much that the thrown-off matter surrounding it now constitutes most of the visible bulk of the object. (N G. C. 4565)

(6) This would look much like the preceding nebula if observed 'edge-on.' Note that the matter of the rings tends to condense into clots, as is also shown by the second nebula in Fig. 1. (N.G.C. 7217)

(7) Perfect rings are, however, rare. More usually the gaseous matter is thrown off from opposite points of the equator only, forming two spiral arms by reason of the nebula's rotary motion. (M. 51)



(8) The clots are nascent stars, or groups of stars, and from them by cosmic accidents planets such as the Earth may be detached; but even the preliminary stages shown in this series have occupied many millions of years. (M. 81)

REMOTEST ORIGIN OF SUNS AND PLANETS SUCH AS OUR OWN

to Dreyer's New General Catalogue of Nebulae; by M., to Messier's count of nebulae and star-clusters

Laplace saw that his primeval nebulous sun must have rotated far less rapidly than this. He imagined it to have had a diameter greater than that of the planet Neptune's orbit, and a very simple calculation will show that if such a nebula rotated once in 27 days, its outer layers would fly off into space, just as splashes of mud fly off a bicycle wheel when it rotates at more than a certain critical speed. In a sense no calculation is necessary, for we know that Neptune revolves round the sun once in 165 years in an apparently circular orbit, and so keeps always at the same distance from the sun, and from this it follows that if the primitive nebula had rotated faster than once

GREAT FRENCH COSMOGONIST

Born in 1749, Pierre Simon Laplace, afterwards the Marquis de Laplace, was famous at the age of twenty for his brilliant publications on the integral calculus. A still greater achievement was his epoch-making nebular hypothesis of 1796.

in 165 years when its diameter was that of Neptune's orbit, its outer layers would necessarily fly off.

Laplace accordingly imagined his primeval nebula to be rotating very slowly. But a well-known mechanical principle, the principle of "conservation of angular momentum," requires that as a body shrinks its speed of rotation shall continually increase. Thus Laplace, while imagining his nebula to have started with enormous size and very slow rotation, supposed the rate of rotation to have increased gradually until, by the time its diameter was about equal to that of Neptune's orbit, it was rotating at the critical speed of one revolution every 165 years. A ring of matter then flew off and ultimately formed the planet Neptune, which has been revolving more or less in the same place and at about the same speed ever since.

The remainder of the nebula went on shrinking and rotating ever faster and faster, until when it had shrunk to the dimensions of the present orbit of Uranus it was rotating once every 84 years. This speed was again such that the outer layers of the nebula could no longer hold together, so that these flew off and formed Uranus. In this way Laplace imagined the planets to be thrown off one after another as the sun shrank down to its present size.

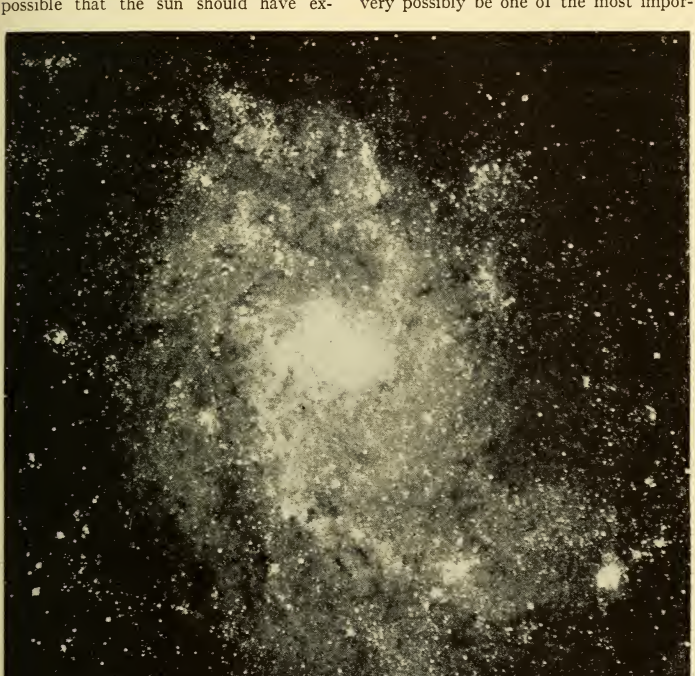
Astronomers no longer believe that this hypothesis gives a true account of the origin of the earth and its sister planets. Out of a multitude of objections three may be mentioned. If the primeval sun was rotating at such a rate as to throw off Neptune, Uranus and the other planets in the way imagined by Laplace, then we can calculate, again from the principle of the conservation of angular momentum, the rate at which it ought to rotate when its shrinkage has reduced to its present dimensions. And the calculated speed comes out nowhere near to that actually observed; the sun's present speed of rotation is too slow for it ever to have thrown off anything at all.

Furthermore, the star which shrinks and rotates faster and faster is an object well known to astronomers; it does not end in a family of planets at all, but breaks up into a double star—two stars of comparable size rotating about one another like partners in a never-ending waltz. Examples of this are frequent. In some the two components are far removed from one another; in others they are quite close together, as though the process of fission had only just occurred, while in others (although this is less certain) the process of fission is not yet complete and the future "binary" star still forms one single elongated mass.

Finally, recent investigations in physics and astronomy fix the age of the earth at something of the order of 2000 million years, while recent investigations in astronomy tell us, with reasonable certainty,

what the size and condition of the sun were 2000 million years ago. At this epoch both the size and structure of the sun appear to have been much what they now are, and it seems to be almost impossible that the sun should have extended out to the earth's orbit, as Laplace's theory demanded.

Although Laplace's hypothesis has failed to explain how the earth came into being, yet the process he imagined may very possibly be one of the most impor-



ONE STEP FURTHER IN THE STORY OF A NASCENT STAR-CLUSTER

With the nebula catalogued as N.G.C. 598, in the constellation Triangulus, we reach a very late stage in the birth of a star colony. Here most of the nebulous matter has condensed and almost the whole of the cloud, even in the centre, really consists of star-like points which prove on investigation to be, in fact, stars. Another point to note in the photograph is that the swarm has begun to 'break formation,' so that although a spiral arrangement can still be traced, it is at this late stage of development very confused.

Courtesy of Royal Astronomical Society

tant in the whole of theoretical astronomy, exemplified in thousands of instances all over the sky, each on a scale incomparably grander than anything imagined by Laplace. For we observe innumerable great nebulae which to all appearances are rotating too fast to hold together, and so are throwing off splashes of matter from their equators; but so great is the scale on which the process occurs that the products of the process are not families of planets but vast armies of stars. In this way our sun was probably born, and Laplace, in trying to solve the mystery of the birth of the child, may have solved, although without knowing it, the problem of the birth of the parent.

Figures 1, 2, 3, 4 and 5 on pp. 30 and 31 show five nebulae selected from different parts of the sky. These are not a mere random selection; they have the special interest that they almost certainly constitute an evolutionary sequence (the nebula appearing in the top right-hand corner of Fig. 1 should be disregarded for the moment). Each nebula has in all probability at some time in the past looked like each one of the nebulae preceding it in the sequence, and will at some time in the future look like each of the nebulae following it.

The first object in this sequence is a diffuse and nearly spherical nebula; it might well be taken as typifying Laplace's primeval nebula except for a collossal difference in size. For whereas Laplace imagined his nebula to have a diameter equal to that of Neptune's orbit, which light crosses in eight hours, the diameter of the nebula shown in Fig. 1 is probably so great that light takes many thousands of years to cross it. The difference in size is that between a grain of sand and Mont Blanc. A million of Laplace's nebulae might be rolled into one, and the composite nebula so formed would still be of too small a size to be visible in Fig. 1.

The future history of this nebula must normally be one of shrinking and of rotating faster and faster, and the mathematician can calculate the sequence of events with very fair accuracy. At first the nebula will bulge at its equator and flatten at its poles, assuming the orange-like shape of which our earth is an example (this stage is already indicated in Fig. 1). As the nebula shrinks further the flattening at the poles and the accompanying bulge at the equator develop more and more, until the bulge becomes so pronounced that the equator is replaced by a sharp edge, and the nebula is shaped like a double convex lens (the ordinary circular magnifying glass). This is shown in Fig. 2.

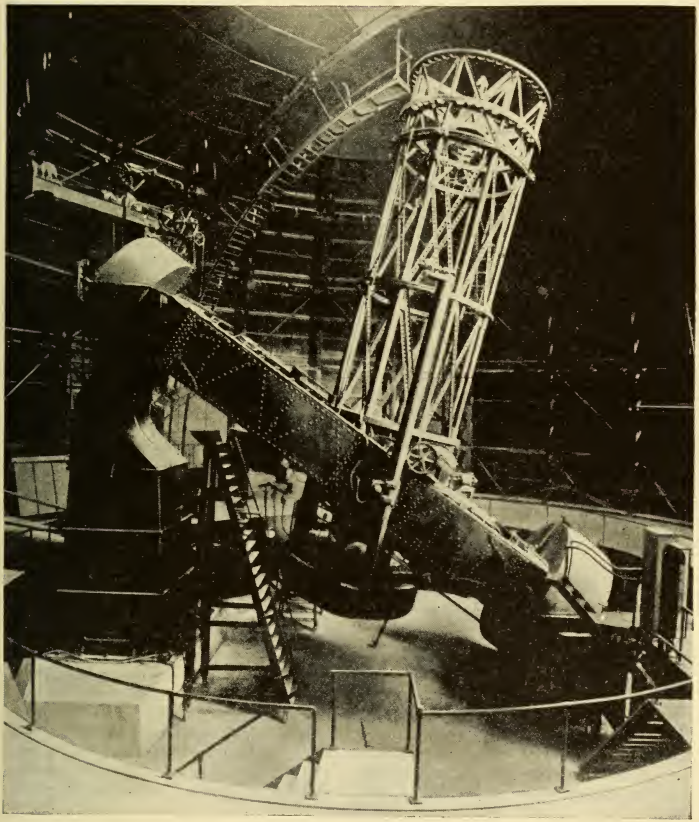
When this stage is reached, the equatorial bulge can go no farther. The next stage is that matter is thrown off from the equator. Fig. 3 shows a nebula in which this process has just commenced, the ejected matter appearing as a faint dark band across part of the equator. Fig. 4 shows a further development; the ejected matter now forms a complete ring, which appears as a dark band in the photograph. Finally, Fig. 5 shows a still more advanced nebula, in which the central mass has shrunk so far that its dimensions are quite small compared with those of the rings of matter it has thrown off. This series of five nebulae has been chosen so that we see them all "edge-on." Fig. 6 shows a nebula which, if viewed "edge-on"—that is, from a direction at right angles to the actual line of vision—would probably look somewhat like Fig. 5. We notice the bright central mass and, surrounding it, the successive rings of matter which have been thrown off in earlier stages of its existence. Let us notice, also, that these rings tend to form granulations or condensations; such a tendency was already to be observed in the outer regions of Fig. 5, but we see it more clearly when we look at the nebula from above as in Fig. 6.

We see it also in the nebula which occurs in the top right-hand corner of Fig. 1. This nebula, which only appears accidentally, is one of the same type as those shown in Figs. 5 and 6, but is viewed at an intermediate angle. It is because a whole series of such nebulae bridge over the gap between the appearances shown in Figs. 5 and 6 that we can be sure that these two nebulae are objects of essentially the same kind.

In some ways Fig. 6 is an exception to the general run of nebulae, for it is very rare to find such perfect symmetry or such clearly formed rings of matter as are shown in this example. More normal appearances are those shown in Figs. 7

and 8 and in the photograph in page 33; in these the matter which has been thrown off forms arms of a spiral shape, as though it were not thrown off symmetrically from the whole equator, but only from two points opposite to one another, as is probably the case.

In the great majority of nebulae some appearance of condensation or granulation is present. Theoretically these con-



MIGHTY INSTRUMENT FOR PROBING THE MYSTERIES OF SPACE

Built in the mountains more than a mile above sea level, Mount Wilson Observatory, near Pasadena, California, ranks as the world's finest astronomical research establishment. Much of the work whose results are embodied in this chapter was done with the Observatory's giant reflecting telescope, whose mirror, 100 inches in diameter, lies at the bottom of the open steel cage shown in the centre of the photograph.

densations or granulations are of high importance. The mathematician can predict on purely theoretical grounds that they must occur, so that when they do occur he knows fairly accurately what they are; they are simply condensations of gas, mixed, perhaps, with a certain amount of dust or other cosmic detritus, which have formed somewhat in the same way in which drops of water form out of a uniform jet, but under the influence of gravitation instead of surface tension.

The mathematician can also calculate what amount of gas there must be in each "drop," and how far apart in space the drops must be. The first of these calculations show that each condensation must contain at least as much matter as the sun, and in general considerably more. The second calculation shows that the condensations, while possibly not so far apart as the distance between the sun and his nearest neighboring suns, must certainly be enormously farther apart than the distances between the sun and the planets surrounding it.

These results prove abundantly that the process which is going on in the nebulae is no mere birth of planets from a nebulous sun; it appears to be nothing less than the birth of suns, themselves perhaps destined to be the parents of planets.

In a well-developed nebula, such as those in Fig. 8 and in page 33, a powerful telescope resolves the outer regions into a swarm of distinct bright points, which at least look like stars, while the central regions retain their nebulous appearance. On passing from younger to older nebulae, the area occupied by these star-like points continually increases at the expense of the nebulous central regions, appearances certainly suggesting very strongly that this latter is changing into stars.

The nebula shown in page 33 is of special interest as representing a very late stage of development in which hardly any of the nebulous center remains; the giant 100-inch telescope at Mount Wilson, California, has shown that it consists almost, if not quite, completely of star-like points. And these shining masses which appear like stars are, so the astronomy of the last few years declares, in actual fact stars of the same kind as we find in other regions of space.

The astronomer expresses the distances of the nebulae by such statements as that the nebula shown in page 33 is about 750,000 light-years distant, and that the great Andromeda nebula is about 800,000 light-years distant. Light is known to travel at 186,000 miles a second, so that it would travel round the earth in about a seventh part of a second. Light starting out from the earth would reach the moon in a little over a second, would reach the sun in eight minutes, and would pass entirely beyond the solar system within four hours. Yet it would have to travel for nearly a million years to reach the Andromeda nebula.

In actual fact, of course, the passage of light is in the other direction; we see the nebula by light which has travelled from it to us. And this light left the nebula almost a million years ago, so that it shows us the nebula as it was and where it was a million years ago. It started when our remote ancestors of 25,000 generations back walked the earth; through the whole of their lives, and those of their sons and sons' sons to 25,000 generations, the light has been traveling at a steady rate of 186,000 miles every second, and has only just reached us.

The greatness of our distance from the Andromeda nebula suggests as a corollary that the nebula itself must be of colossal size to be visible to us at all. Calculation demonstrates that its actual diameter must be something like 70,000 light-years. The ratio between the 70,000 years which light takes to traverse the nebula and the eight hours which it takes to cross the whole solar system gives the ratio of the sizes of the two structures.

In respects other than size, the nebula is built on an heroic scale. The total amount of matter it contains is some thousand million times as great as that in the whole solar system. The speed of its motion is prodigious; it is moving away from our galaxy at a speed of about 120 miles a second, while its outer parts have a velocity of rotation about its center which is still higher. And yet such is its size that these outer parts must travel for some 20 millions of years before they have performed a complete revolution.

The conception of these majestic rotations of the nebula, each taking some 20

million years or so to perform, inevitably raises the time question. How many of these rotations does the nebula perform in its life, how far can we trace its history back into the past, and how far will it extend into the future? This brings us to the wider question as to the age of the stars and of the universe in general.

This provides one of the most fascinating problems of modern astronomy. It must be said at once that no completely satisfactory solution has yet been found. Different pieces of evidence seem to suggest different ages for the universe, ranging from a few thousand million years to a few million million years, but no line of argument is absolutely conclusive. The most convincing evidence comes from a study of the present dispositions and motions of the stars, and this provides rather compelling evidence that the stars must have existed for millions of millions of years. And if the stars are really of so great an age we are confronted with the problem of discovering how they obtain enough energy to provide for their radiation through such immense periods.

Our sun radiates energy in the form of light and heat at a rate which we can estimate by measuring the rate at which solar heat reaches the earth. If a power station were built outside the sun and charged with the task of supplying the sun with energy as fast as the sun radiated it away, this station would have to burn coal at a rate of three million million million tons a minute. As no external source of energy is known which can provide more than a tiny fraction of the energy radiated away, we must suppose the sun's radiation to originate from something stored up in its interior. Now, if the whole of the sun were nothing but a mass of pure coal, its burning would supply energy for only a few thousand years at the sun's present rate of radiation.

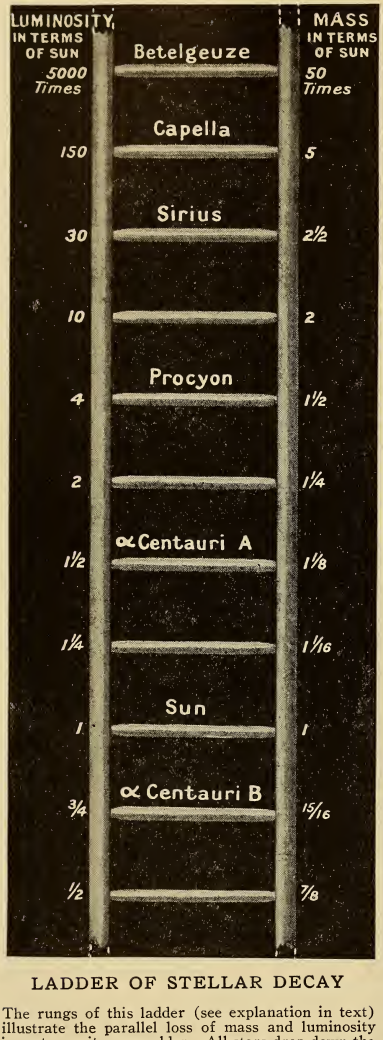
The falling-in of the sun's mass under its own gravitation could provide energy for a much longer period, some twenty million years, but this is still far too short to be reconciled even with the known age of the earth. For the oldest terrestrial rocks carry in them clear evidence of having existed continuously, in their present solid form, for at least 1,750 millions of years, and no view of the sun's radiation can be accepted which does not provide for radiation over a longer period than this.

The hopes at one time held out by radioactivity have not materialized; a sun made of pure radium would radiate far more fiercely than the present sun, but radium has no capacity for lasting for more than a few thousand years. Uranium alone has the requisite lasting capacity, but a sun built wholly of uranium would radiate at only about half the rate of our sun. Thus we must conclude that no source of radioactive energy known to us on earth can account for the sun's radiation.

The theory of relativity teaches that any radiation of energy is necessarily accompanied by a loss of mass in the radiating body. The loss of mass corresponding to a known radiation of energy is easily calculated, and it is found that the sun must be losing mass at present at the rate of about four million tons a second. Judged by our terrestrial standards, this seems enormous, but the sun can stand the drain for a very long time without any appreciable diminution of this great mass; radiation for the 1,750 million years during which we know the earth to have existed would reduce the solar mass by only a little more than a hundredth part of one per cent.

We have seen, however, that there is evidence that the stars have existed for periods enormously greater than this, periods which must, in all probability, be measured in millions of millions of years. In such a period the loss of mass would not be negligible; it would be a considerable fraction of the whole mass of the star. Hence, it seems likely, and indeed almost inevitable, that the stars obtain most of their energy of radiation by an actual annihilation of their mass.

The combustion of coal does not, of course, annihilate the atoms of which the coal is formed; it merely rearranges them in combination with some added atoms of oxygen. The burning process merely skims off the very topmost layer of the energy resident in the coal. Nor does radioactivity involve the annihilation of the electrons of which the atoms are built. The energy produced by the annihilation of matter is of a different order



LADDER OF STELLAR DECAY

The rungs of this ladder (see explanation in text) illustrate the parallel loss of mass and luminosity in a star as it grows older. All stars drop down the ladder step by step, each step representing about a million million years of a star's life.

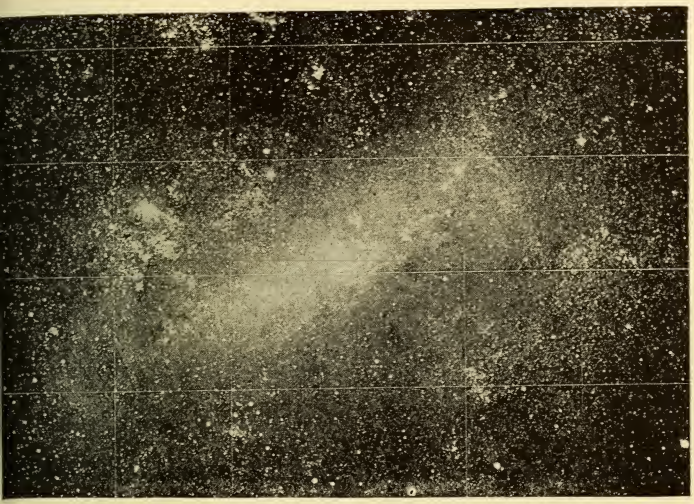
altogether; the annihilation of one ounce of coal a day would provide more than enough enegry to run the whole of the industries, transport and domestic lighting and heating of the British Isles. It is by the successive annihilation of ounce upon ounce, ton upon ton, and millions upon millions of tons of his mass that the sun is able to maintain its output of energy for millions of millions of years. We must think of each atom in the sun as a store of bottled-up energy; these bottles are continually being broken and their imprisoned energy set free in the form of light and heat with a corresponding diminution in the sun's total mass.

If this is the true origin of the sun's radiation, it must apply to the other stars as well, and we must picture all the stars steadily losing weight as they grow older.

In human life a grown man has twice the weight of a boy of eleven, who in turn has twice the weight of a boy of four, who has twice the weight of a baby of seven months, and so on. A similar table could be constructed for the stars, but the youngest stars would be the heaviest. For every ton of matter in the very young star Betelgeuze there is only about a hundredweight of matter in the older star Sirius, and only about forty pounds in our still older sun.

This is not, however, the end of the affair. For when we know the rate at which a star is radiating energy away, a simple calculation gives the rate at which he is losing weight, and this in turn gives the time necessary to take the next step down the evolutionary ladder to the next stage of smaller weight. The result of calculation can be exhibited diagrammatically in the form of a ladder (left).

In this diagram evolution is downwards, from the higher parts of the ladder to the lower. The step from each rung of the ladder down to the next lower occupies approximately a million million years, Thus the 1,750 million years, which seem such a stupendous age for our earth when judged by terrestrial standards, fade into insignificance when viewed in terms of



STARRY SWARMS THAT MAY DERIVE FROM NEBULAE

Above we see the ultimate product of one of the larger spiral nebulae—the Greater Magellanic Cloud (Nubecua Major), a patch of densely crowded stars, somewhat like the Milky Way. A smaller nebula may result in a star-cluster like that shown below. This is so far away from us that Sirius, apparently the brightest star in the heavens, would be invisible if placed at the same distance.

the stellar time-scale; they are represented by only about a six-hundredth part of one single step of the ladder.

The approximate amount of matter contained in each of the stars which stand on any rung of this ladder is shown by the number on the right of the ladder; this represents the star's mass on a scale in which the sun's mass is taken to be unity. Similarly, the approximate luminosity of the stars on any rung is shown by the figures on the left; these give luminosities on a scale in which the sun's luminosity is taken as unity. Sirius, for instance, which stands six rungs up above the sun, is seen to contain some two and a half times as much matter as the sun. We should also have to take thirty stars each as luminous as our sun and place them all together to get a light as bright as that of Sirius.

This diagram can be used in still another way, for it shows that six million million years ago the sun was thirty times as luminous as it now is, and contained two and a half times as much matter as now; the reduction in its mass, of course, represents the total amount of radiation which has been emitted in the interval. And in six million million years—if nothing happens to change the normal course of events—Sirius will be reduced in glory until his mass and his luminosity are no greater than those of our present sun.

A general study of the numbers on the right and left of the ladder at once discloses one salient feature. Both the mass and the luminosity of a star run down far more rapidly in its first period of a million million years than in any subsequent period. We do not quite know where the ladder begins, but the change is so rapid at first that the period of time represented by the part of the ladder above that shown can hardly be very great.

To a tolerably good approximation we can count ages from the highest rung of the ladder shown on the left and say that Capella is one million million years old, Sirius two million million, the sun between seven and eight million million, and so on. A reservation has to be made in the case of binary stars, since an abrupt redistribution of mass occurs when fission into two stars takes place. There can, of course, be no definite bottom end to the ladder, for however old a star is it can still get older; the ladder goes down endlessly into eternity.

There may perhaps be a definite limit to the depths of the ladder to which stars have so far penetrated, but it is hard to say what this limit is, because as stars get older they also become more invisible, so that it is very difficult to pick out the oldest stars of all.

Perhaps, too, the ladder may have no very definite top. Some stars may be born out of their parent nebulae with masses about fifty times as great as that of the sun, and so start on the top rung shown in page 38, while others, born with a mass only about five times as great as that of the sun, start one rung down. Even the stars which are born out of a single nebula must not be expected all to start with equal masses, but stars born from different nebulae are likely to be far more unequal than those from a single nebula.

A further consideration connected with the birth of stars may be mentioned here. We have already noticed the enormous size of the spiral nebulae, and mention has been made of their enormous masses. The Andromeda nebula has about a thousand million times the mass of the sun. But it has about a million million million million million times the size of the sun, so that it exceeds the sun far more in size than in mass. To put it in another way, a ton of matter must take up far less room in the sun than it does in a spiral nebula; the sun is far more compact or, to use the proper scientific term, far more "dense."

Let us imagine that every atom of air has been extracted from the Albert Hall, and that when this has been done a common house fly takes one breath of air and discharges it into the Albert Hall. Following the laws of gases, this breath of air must expand and fill the whole Albert Hall; yet when this has happened the air in the Albert Hall will be considerably more dense than that of nebular material. Without laboring the point further, it will be clear that newly-born stars must be expected to be of extreme tenuity: and such is found to be the case.

It has recently been possible to measure by direct observation the diameter

of Betelgeuze, the star which we have selected as a typical new-born star to stand on the topmost rung of our diagrammatical ladder. The fact that the angle subtended by this star is found to be rather less than that subtended by a pin-head at a distance of six miles will give some idea of the difficulty of the observations. The star is found to have a diameter about 300 times as great as that of our sun, so that his mass, which is only about fifty times that of the sun, occupies a volume equal to about twenty-seven million times that occupied by the sun. A simple calculation now shows that the average density of Betelgeuze must be about one four-hundred-thousandth that of water, or about a five-hundredth part of the density of atmospheric air. The ordinary air in an average room on earth weighs about a hundredweight, but a roomful of gas of which Betelgeuze is formed would weigh only about three ounces.

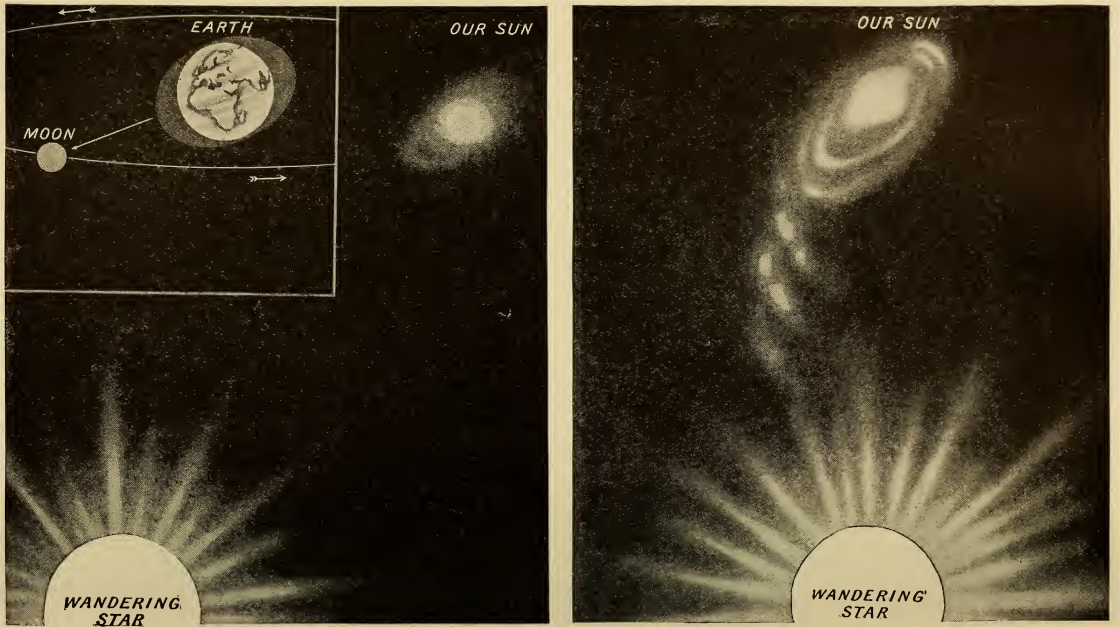
In passing, it may be mentioned that at the other end of the scale comes a group of old stars known as "white dwarfs." Their average density is about 50,000 times that of water, while the density in their central regions is probably a full million times that of water —a golf-ball made of matter of this density would weigh about fifty tons, while a roomful of this matter would weigh some two million tons, a weight sufficient to sink the whole of the British Navy. Between the very tenuous stars, such as Betelgeuze, and these there is an almost continuous succession of stars of ever-increasing density, and it seems likely that, broadly speaking, this succession is also one of increasing age. We have already seen that as a star gets older its mass and its luminosity decrease. We now see that its density increases, so that it becomes more and more compact.

This may end our survey of the birth and life histories of stars, the parents of planets. We started from the nebula, behind which we cannot at present penetrate, and have seen how dynamical forces, arising from the gravitational attraction of its parts, cause it to assume a regular shape, to spin faster and faster until finally matter is thrown off its equator much as drops of rain are thrown off the rim of a whirling umbrella. These "drops" are stars, but not stars on the comparatively puny scale of our sun. The condensations in the arms of a spiral nebula represent a procession of stars of an altogether more heroic type. Each star, while perhaps some ten or twenty times as massive as our sun, is thousands of times as luminous and millions of times as large. But in contradistinction to living organisms the fate before them is to grow steadily less impressive as they grow older. Heaven lies about them in their infancy, but after a few hundred thousand millions of years the shades of the prison-house begin to close about them; they shrink in size, diminish in mass, their luminosity becomes dimmed and they are well started on the long path which ends in ultimate darkness.

While the stars are broadcasting their mass in the form of energy-radiation, they are moving about in space, each star having its path determined by the gravitational attraction of other stars. It might be thought that after a short time the stars born out of different nebulae would become inextricably mixed in space and that space would become uniformly peopled with stars; but this does not prove to be so. The astronomer commands means for probing the distribution of stars in space, and the first outstanding fact he encounters is that after proceeding a certain distance in any direction there is a marked thinning of stars.

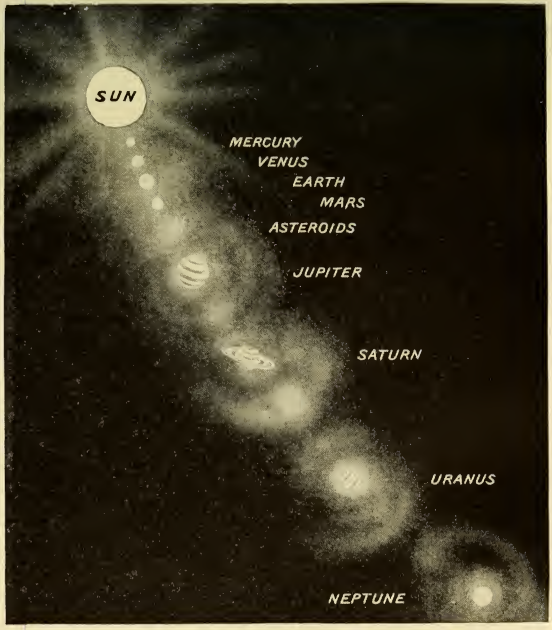
We have already pictured to ourselves the million-years-long passage of a ray of light from the Andromeda nebula to our earth. For the first few thousands of years this ray is passing between the stars which form the outlying regions of the nebula. For the last few thousand years also it is passing through regions of space which are tolerably well filled with stars. But in the intervening period, which represents by far the greater part of its journey, it is voyaging through space in which stars are scattered very sparsely.

Investigation shows that the stars fall into distinct colonies, so far apart that emigration from one colony to another is comparatively rare. Herschel described these colonies as "island universes," and there is no need to cavil at this description today. The colony of stars of which our sun is a member is



FIRST STAGES WHICH ACCORDING TO THE TIDAL THEORY EXPLAINS THE BIRTH OF THE WORLD

One explanation of the birth of the world is known as the tidal theory. According to this the process was not a matter of millions of years, but of a few months. It is thought that some wandering star about 2,000 million years ago approached near enough to our sun to raise two hummocks of gas upon its surface: as the two bodies drew closer the near hummock became drawn out into a long arm pointing towards the wanderer.



HOW AN ARM OF GAS DRAGGED FROM THE SUN BY A STAR CONDENSED INTO THE SOLAR SYSTEM

Had the path of the wanderer been slightly different the result might have been utter disruption or a head-on collision. But it passed on its way, and the arm of gas, becoming detached from the sun, broke up into condensations like the nebular arms shown in the plates on pages 30-31. Finally these condensations formed the planets that we know, revolving round the sun, though the smaller of them, perhaps, dispersed before solidifying.

believed to be shaped rather like a biscuit or lens; indeed, it is somewhat similar in shape to the nebulae in Figs. 2 and 3 (plate, page 30); the Milky Way forms its equator, and the reason that stars appear to be so thickly scattered along the Milky Way is that here we are looking through the greatest diameter of the lens. Looking in a direction perpendicular to this, we soon come to outer space, and so see but few stars.

In page 39 is a colony of stars, the Greater Magellanic Cloud, which lies on the confines of the Milky Way. The stars which it contains are in many respects similar to those in one of the big well-developed spiral nebulae, and it seems likely that such a star-cloud may be the final product of a spiral nebula of this type; if so, this picture may be tacked on to the series already given, and the complete sequence will form a description of the evolution of a colony of stars.

In page 39 (bottom) is a photograph of another colony of stars still more remote. Its distance is so great that only the very brightest of its stars are visible at all. Each point of light in the photograph represents a star whose luminosity is many times as great as that of our sun; stars having the luminosity even of Sirius are invisible, so that we can only see the stars which stand on the topmost rungs of our ladder.

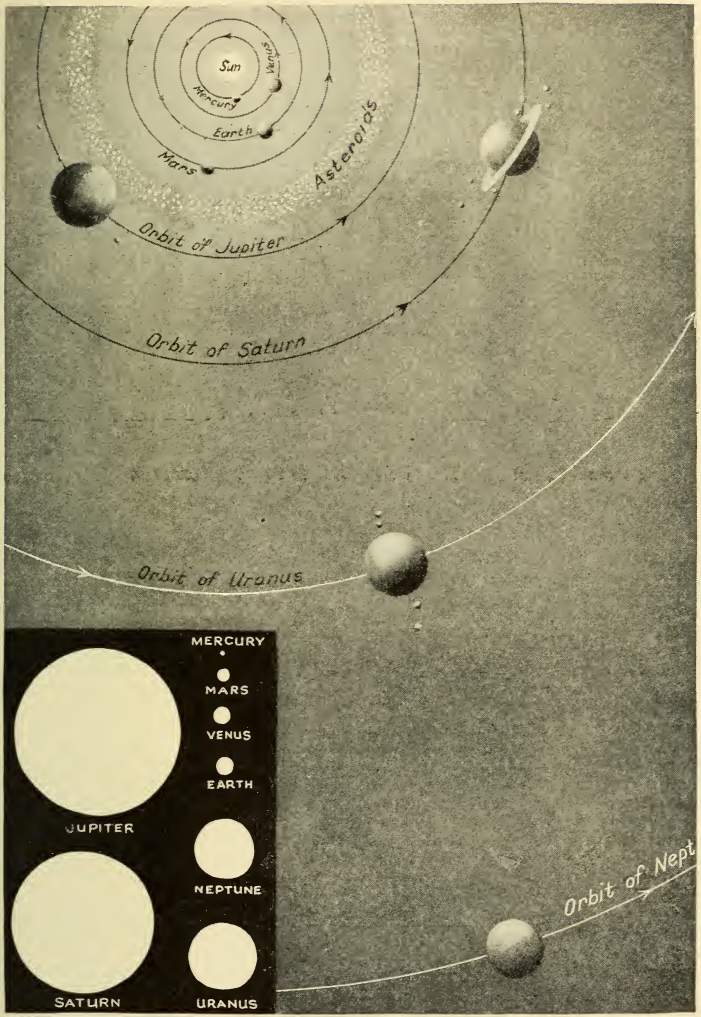
The stars of any one colony move irregularly past one another, much like a swarm of bees round a hive. The motions of the stars near to our sun, which have been examined in considerable detail, show very little regularity, although it is true that the stars fall fairly clearly into two main streams, and a variety of smaller streams has also been detected. If we may not compare stellar motions to the random motions of a swarm of bees, we may at least think of them as similar to the motions of two swarms of bees which have got mixed up together and are not far from inextricable confusion.

Bees, however, look where they are going; stars cannot. As they rush blindly on their courses they must at intervals run into one another. Actual collision must be very rare, because of the great intervals which separate the stars. If we place an apple at the center of the earth and place a grape-fruit, two more apples, two apricots and a currant in the six continents of the earth's surface, we shall have a fairly good scale-model of the arrangement in space of our sun and its six nearest neighbors. We can represent the motion of these stars in our model by supposing all seven fruits to move about completely at random at the speed at which the ends of the hour-hands of watches and small clocks move. It is at once clear that collisions must necessarily be very rare events; even close approaches will be very rare, although neither collisions nor close approaches can be entirely dismissed from consideration in a universe in which the stars have been "swarming" for millions of millions of years.

An approach of two stars, even if not close enough for an actual collision to take place, may have profound cosmogonic consequences. Every star in the universe influences every other star, no matter how far away it may be, through the agency of universal gravitation. When the stars are far apart their mutual influence is exceedingly slight, but when they are fairly close together the effects of gravitation may become highly important. The moon, although it has only one-eightieth of the mass of the earth, raises substantial tides in the oceans on the earth's surface.

If the moon were replaced by a second earth, these tides would be eighty times greater than they are, and in place of an average tide of thirty feet we should have an average tide nearly half a mile in height, which would inundate all except the highest land every twelve hours. Imagine that this second earth, instead of being thirty times its diameter away from our earth as the moon is, were brought to within a distance about equal to the earth's diameter. The conception of tides fails utterly to explain what would now happen. A huge mountain of water some hundreds of miles high would travel round the earth once every twenty-four hours, followed by a similar but smaller mountain of water at twelve-hourly intervals.

Mathematical analysis proves that the course of events when two gaseous stars approach fairly close to one another must be very similar. The main difference is



THE EARTH AND ITS NEAREST NEIGHBORS IN SPACE

It is in this order that the planets—that earth upon which the drama of Man's history is being played out and its nearest neighbours in the wastes of space—swing endlessly round the sun. Neither their orbits nor the sun are drawn to scale, for on the scale to which the sun is drawn the earth should be about two feet away; but the inset gives the relative sizes of the planets.

that the stars have no solid unyielding surface over which tides can travel, so that their whole structure is battered out of shape by the gravitational pull of the neighboring star. It is found that the less massive of the two stars will suffer the more severely from the encounter. When the more massive star approaches sufficiently close, it creates very exaggerated tides on the less massive star.

At first these may look like ordinary tides, but as the other star approaches nearer, and its gravitational pull becomes more intense, these tides resolve themselves into two mountains of stellar matter travelling over the star's surface. Finally, a still closer approach changes these mountains into two long arms of gas which the star throws out from its surface; one, the longer one, towards the wandering star which is the cause of all the trouble, and the other, the shorter one, diametrically away from it. Yielding still further to the gravitational pull of the wandering star, these arms are pulled more and more out of shape and, if conditions are favorable, one or both may become entirely detached from the parent star and break into drops, much in the same way as the gaseous matter in nebular arms has been seen to form into drops. According to the tidal theory of the genesis of the solar system, each of these drops forms a planet.

The tidal theory, either in the form in which it has just been described or in some closely similar form, is generally accepted by astronomers as depicting the most probable method of birth of planets. On the other hand, it has to be admitted that observational astronomy can bring no direct ocular evidence to the support of the theory. This is inevitable, and is an objection which must apply equally to all theories of the genesis of planetary systems. For, as has already been mentioned, planetary systems round other stars are too small to be seen in our present telescopes at all: no human eye has ever seen any such system except our own, nor ever will until either the size of telescopes or the sensitiveness of photographic plates has been greatly increased. Moreover, even if this had been achieved, and we were in possession of telescopes and photographic plates far in advance of anything now at our disposal, a further obstacle would remain. If the tidal theory is true, the whole transformation of a simple star into a solar system of sun and planets is a matter at most of a few years, perhaps even of months.

In the whole of the millions of millions of years of a star's existence the great event happens at most once—for most stars not at all—and if it happens it occupies only a few years. A watcher must watch with extraordinary care to see it happening, and even then the chances are that he will fail through no such event occurring in his lifetime. There is a marked contrast between the birth of suns out of nebulae, a process which occurs on so majestic a scale that our telescopes enable us to study it with ease, and with such slowness that we find innumerable examples of it at any moment, and the birth of planets out of suns, a process which is too small in scale, too rare in occurrence and too short in duration for us ever to hope to see it.

A still further contrast claims our attention. The tidal theory supposes the birth of planets to be in effect nothing but an intensification of the process which causes the ebb and flow of the tides along our coasts. The birth of stars, on the other hand, arises from an intensification of the process which causes splashes of mud to fly away from a bicycle wheel in motion. If we are right in supposing spiral nebulae, suns and planets to form three successive generations in the process of filling the heavens with inhabitants, we might reasonably have expected a certain similarity in the births of successive generations; we might perhaps have expected the births of suns and of the planets to have been as similar as the births of children and grandchildren in human life.

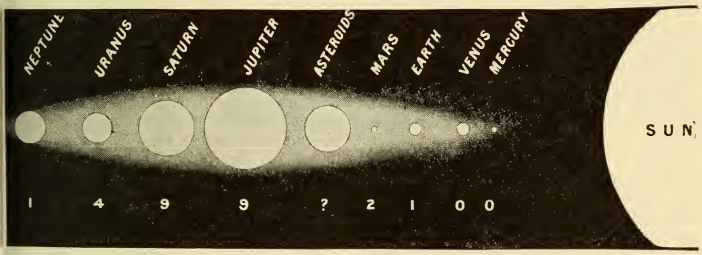
The essential difference, which causes the analogy to fail, is that children and grandchildren are of the same size at their birth, while suns and planets are not. In actual fact the same agencies are at work when planets are born as had previously presided over the birth of their parents; but, as a consequence of a great difference in scale, they occur in different proportions.

Rotation, which caused the break-up

of the original nebula into suns, must also be present when the suns give birth to planets; if there were no rotation the embryo planets would fall back into the sun and could have no independent existence. And tidal forces, which are the main agency in the birth of planets, must be present also at the break-up of a nebula into suns; it is probably the action of tidal forces which causes the matter ejected from a nebula generally to form two distinct arms, as in Figs. 7 and 8 page 30, instead of coming off in circles, as in Fig. 6; the two arms of the nebula are the precise analogue of the long arms drawn out of a star by tidal action, or again of the two mountains of water which we have imagined following one another round our earth's surface. The scientist is well accustomed to cases in which different natural agencies assume importances which vary according to the scale on which phenomena take place. The flight of a golf-ball is different from that of a football, not because different forces are at work in the two cases, but because the same forces act in different proportions; the fall of a raindrop is different from either, although still governed by precisely the same forces.

Although the birth of planets appears to demand the presence of powerful tidal forces, and consequently the close approach of two stars, there is practically no room for doubt that a star can break up by rotation alone, tidal action, if it is present at all, playing an entirely subsidiary part. The final product of this process is not a sun surrounded by a family of planets, but a double star of the type already mentioned—two stars each about equal to half of their parent star, which eternally waltz round one another. Thousands of such systems are known in the sky, and nearly half of the total number of stars are believed to have broken up into binary systems in this way. Indeed, these binary systems form the normal end of the chain of stellar evolution; solar systems such as our own are comparatively rare and something in the nature of freaks.

This is easy to understand. The fission of a single star into a binary can occur whenever the star is rotating with sufficient speed; it is in no way dependent on the presence of a neighbor. But the birth of a solar system can occur only when a neighboring star is very close at hand. Exact calculation demonstrates that, with the stars moving as they now are in the neighborhood of the sun, in a period of seven million million years only about one star in a hundred thousand will approach near enough to another for the birth of a solar system to be possible, and even then there are odds to perhaps ten to one against a solar system actually being formed. If we suppose the average star to have existed for seven million million years, which is about the age of our sun, this calculation suggests that only about one star in a million can be surrounded by planets. Thus the whole colony of some 1,500 million stars, of



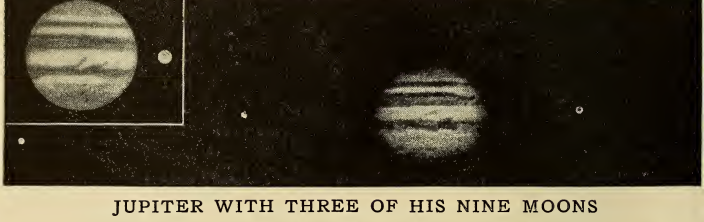
TIDAL THEORY OF PLANETARY ORIGINS

The planets fall roughly within an outline that represents the cigar-shape of just such an arm of gas as might have been dragged from the sun by the pull of a neighbouring body. The figures below the planets in this diagram give the numbers of their satellites. The more recently discovered Pluto must be placed at the extremity of the cigar, but its size and the number of its planets (if any) are still unknown.

which our sun forms a member, can only contain some 1,500 systems similar to that of the sun.

This calculation probably errs in the direction of over-estimating the odds against the formation of solar systems. When a star is in the earlier and more tenuous stages of its existence, it is far more susceptible to the tidal influence of other stars than when it has become a compact and comparatively small body like our sun; it both offers a bigger target, so to speak, to other wandering stars, and its flimsy structure is more easily pulled out of shape. Also it is probable that in earlier ages, especially immediately after their birth, the stars were more closely packed than they now are, have no planets in attendance on them, and are themselves totally unsuited to be the abode of life. For a sun to support life is the exception; the normal sun eternally radiates energy away into endless space without affecting life of any kind. Life must be much more rare, must form far less of the total of the universe and enter less into the scheme of things, than was thought half a century ago. It is not altogether inconceivable, although very far from probable, that our own earth may be the only abode of life in the whole universe.

We have seen how, when the tidal arm of matter first became detached from our sun, it broke up into separate condensations, each of which formed a planet.



JUPITER WITH THREE OF HIS NINE MOONS

Just as the gravitational pull of a wandering star may have dragged the planets from the sun, so the same star—or more probably the sun itself—may have acted upon these offspring of the second generation to form a third generation of satellites. Jupiter, which is the largest of our family, has nine. Inset is a comparison of its bulk with the earth.

in which case close encounters of pairs of stars must have been of more frequent occurrence. But after all allowances have been made it seems impossible that solar systems should be quite common objects; the total number in our colony of stars must almost certainly be reckoned in thousands rather than millions, and there are probably not many thousands.

When it was first realized that every point of light in the sky represented a sun, similar in its main features and characteristics to our own, it was natural to assume by analogy that the reason of its existence was the provision of light and heat to the inhabitants of planets circling around it. The calculations just mentioned call a halt to such speculations. They suggest that only very few stars perform this function; most stars

From the mode of its formation this arm of matter would necessarily taper off at both ends and be thickest in its middle parts; it must have been somewhat cigar-shaped. We should expect more massive planets to form out of the central parts than out of the ends of this tidal arm. This is confirmed by the present order of the planets, which may be diagrammatically represented as in the upper of the two illustrations in this page. The largest and weightiest of the planets, Jupiter, is near the middle, and the planets taper off in size as we pass to either end.

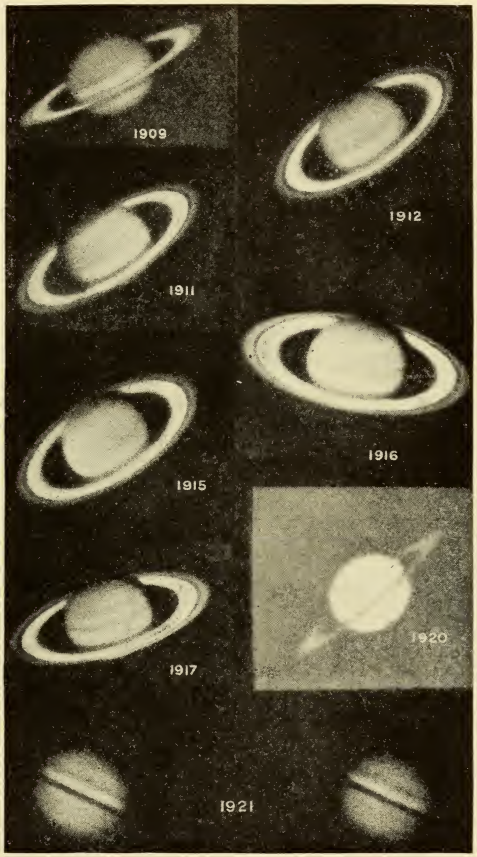
By surrounding the planets in the diagram with a hazy outline, we can reconstruct, in imagination, the cigar-shaped filament as it was when it was first drawn off from the sun by the tidal pull of a near star. The smaller planets were too

small to survive for long as spheres of gas, and so must have first liquefied and then rapidly solidified. The larger planets were under no such necessity; Jupiter and Saturn have probably remained mainly gaseous to this day.

We have spoken throughout of the inhabitants of the sky as forming three generations—nebulae, stars and planets—but their genealogy extends to a fourth generation, the satellites of the planets. Since the time when Galileo first noticed that the systems of Jupiter and Saturn formed miniature replicas of the system of the sun, there has been little room for doubt that these minor systems must have been born after the same manner as the main solar system. The tidal theory gives a very satisfactory account of the origin of these satellites.

When Jupiter first came into existence as an independent planet, he found himself already under the tidal influence of a far larger mass, the sun, and possibly also of the wandering star which was the origin of his being. Moreover, as his orbit was probably far from circular, its nearest approach to the sun may have been so near as to tear him to pieces, just as the sun had previously been torn to pieces by the tidal pull of the still larger wandering star. It is, then, only natural that Jupiter should have such a system of satellites.

Indeed, it might be supposed that the process could go on for ever, to generation after generation; that the satellites under the tidal influence of Jupiter should give birth to sub-satellites, and so on *ad infinitum*. Saturn's rings, which consist of enormous numbers of extremely minute satellites, are generally supposed to have been brought into existence by some



SATURN IN VARIOUS POSITIONS

The rings of Saturn which so puzzled astronomers—they appeared like handles through Galileo's little instrument—are now thought to be composed of countless tiny satellites, and may have been formed by the break-up of several larger ones.

Courtesy of Lowell Observatory

such process, and the asteroids, which form a great swarm of minute planets, may be a second instance of the process.

But in general the endless repetition of the birth-process is prevented by the circumstance that only masses above a certain size hold together gravitationally, unless they happen to be in the solid state. A puff of gas disperses rapidly into space; a drop of liquid is evaporated within a time which is very short when judged by astronomical standards; the only way in which small masses either of gas or liquid can hope to persist through times of astronomical length is by solidification almost immediately after birth.

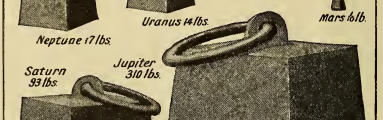
Theoretical considerations show that an entirely gaseous planet ought to give birth tidally to a large number of small satellites, while the satellites of a liquid planet, if they occur at all, ought to be few in number and larger in size, relative to the size of the planet, than those born out of a gaseous parent. Jupiter and Saturn, which are even now mainly in the gaseous state, have presumably always been so. Thus it is entirely in accordance with the tidal theory that these large planets are found to be attended by large numbers of small satellites.

But we have seen that the planets nearest to and farthest away from the sun—those which were formed out of the two ends of the original filament—probably cooled so rapidly as to become liquid immediately they were born, so that these ought, according to the tidal theory, to be surrounded by fewer but relatively larger satellites. This is found to be so. The number written under each planet in page 47 indicates how many satellites it possesses; we see that this number is greatest for Jupiter and Saturn and tails off in each direction. The prediction as to size is also fulfilled; the satellite most massive compared with its primary is our moon.

Piecing all the evidence together, we may be fairly certain that our earth must have attained a liquid or partially liquid state either during or immediately after its birth, and that while it was in this state it gave birth to the moon under the tidal influence, probably of the sun, although just possibly of the wandering star which had originally been responsible for the birth of the earth itself. The evidence of geology and of radioactive rocks fixes the date of these events at something like 2,000 million years ago, in round figures.

This period is so small in comparison with the total age of the sun (about seven million million years) that the sun cannot have been very different when our earth was born from what he is at present We picture the earth and her sister planets cooling down, rapidly liquefying and finally solidifying. In the earliest years of their existence satellites are born and these, if not originally liquid, must either liquefy and solidify at once or else dissipate into space, leaving no record of their existence behind; only those survive which become solid almost at once.

Our earth appears at first as a liquid or plastic globe with its single satellite revolving round it. The two masses are much nearer together than they now are, the moon consequently distorting the earth's surface to a very appreciable extent. As the plastic earth becomes more solid the tides raised on it by the moon no longer travel over its surface but form a standing feature on this surface, and, as the earth finally solidifies, become perpetuated as table-lands, mountains and ocean beds. The circular Pacific Ocean perhaps provides the clearest tangible evi-



MASSES OF THE PLANETS

Allowing the earth a weight of one pound, this drawing gives the relative weights of the moon and other seven planets on the same basis. A better scientific term for weight is 'mass.'

dence of the action of the moon upon the plastic earth, although the once cherished view that the Pacific basin marks the place from which the moon was originally scooped out is hardly tenable today. Tidal forces must inevitably have resulted in the moon receding farther and farther from the earth.

In the meantime the supply of heat which the earth brought with it from the sun is being radiated away into space. The earth cools down and, as it does so, plastic masses become solid rocks and the irregularities of the surface are petrified into a permanent record; vapors condense into liquids and the oceans are formed; the more permanent gases alone remain uncondensed and constitute an atmosphere. Evaporation and condensation, rain and storms occur, rivers spring into being, and disintegration, attrition and sedimentation begin; the stage is being prepared for the next great act of the drama, the appearance of life.

Although we are a degree less sure that this is the true course of events than we should be if it were possible to study the birth of other worlds through our telescopes, yet theoretical considerations leave very little doubt that the birth of our earth took place much in this way.

Our own colony of stars—the galactic system, bounded by the Milky Way—is believed to contain something like 150,000 million separate stars. Accepting the foregoing view as to the origin of the solar system, calculation shows that planetary systems can hardly be produced in this colony at a greater average rate than one every 60 million years. Thus only about 30 planetary systems, at most, can have been produced since our earth was born, and the planets attending our sun must be some of the youngest in the whole colony of stars.

A variant of this calculation is of still greater direct interest to us. Civilization on earth is, let us say, 10,000 years old. If solar systems come into being at the rate of one every 60 million years, and if each contains ten planets suitable for life and destined ultimately to be the abode of life, then civilizations come into existence at an average rate of one every 6 million years. This gives a very large probability that our terrestrial civilization, with only 10,000 years to its credit, is the youngest in the whole colony of stars. Of all the planets in the galactic system the inhabitants of our own are probably the most inexperienced in civilization.

This conclusion leads to at least one reflection of practical interest. We are apt to think of ourselves as living at the end of time. The feeling has perhaps been intensified by recent events on our planet, but it has been common to all ages; it doubtless expresses an illusion resulting from past time being known to us while future time is unknown. The "end of time" feeling does not obtrude in epochs of what is commonly described as rapid progress, but when progress is thought to be in the wrong direction, from good to bad or from bad to worse, it comes bringing in its train pessimism or despair.

A review of events on the astronomical scale puts such reflections in their proper perspective. We are not living at the end of time, but, as far as our earth is concerned, at the very beginning; our lot is to live through the fresh glory of early morning, not to watch the inexorable lengthening of evening shadows.

PERIODS		ANIMAL DEVELOPMENT
PRIMEVAL PERIOD		PRIMITIVE INVERTEBRATES
PRIMARY PERIOD (Era of Ancient Life)	Cambrian	Seas teem with life: oldest fossils
	Ordovician	Earliest vertebrates (ostracoderms)
	Silurian	Land plants, land invertebrates (scorpions) and true fish. "Age of Sea Lilies."
	Devonian	First turf. Primitive tree ferns, etc. True fish leave shrinking rivers and take to open sea
	Carboniferous	Fish, forced to evolve by Devonian drought, become first amphibians. Huge swamps and forests
	Permian	Amphibians take to life on dry land and reptilian forms increase and develop
SECONDARY PERIOD (Era of Middle Life)	Triassic	Reptiles dominant. Amphibians retreat to water again. Mammals appear
	Jurassic	Age of Giant Reptiles. Reptiles masters of every element. Archaic birds evolve
	Cretaceous	Monstrous reptiles. Modern fish and flowering plants begin to evolve.
TERTIARY PERIOD (Recent Life)	Eocene	Giant reptiles vanish, their place being taken by mammals.
	Oligocene	Horse and elephant continue to evolve; cat and dog forms appear
	Miocene	Immense herds of rhinoceros, antelope, pig, three-toed horses, etc., preyed upon by hyenas, wolves, bears and sabre-toothed cats. Anthropoid ancestors of gorilla, chimpanzee, orang, gibbon and Man diverge from common stock
	Pliocene	Ancestral forms of all living animals in evidence; these include true elephants and one-toed horses. Man appears towards end of period. Onset of Ice Age

THE WORLD'S LIFE THROUGH THE AGES

THE MAKING OF THE EARTH

GEOLOGY TRACES THROUGH AEONS OF TIME THE CHANGES THAT MADE THE EARTH FIT FOR ANIMAL AND HUMAN LIFE

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THE countless myriads of stars include comparatively few that can possibly be the home of Man or other form of life. Of the heavenly bodies of which most is known some are too hot and others are too cold, or are subject to sudden fluctuations from excessive heat to intense cold. The development of Man was only possible where there existed the benefits of a moderate temperature, a suitable atmosphere, ample supplies of water, metallic ores and materials for pottery and building, and where also primitive, simple forms of life, both animal and plant, had by their long occupation of the world prepared food, fuel and a fertile soil for Man's uses.

The earth as a whole consists of a central core surrounded by five shells. The central core, about 1,600 miles in diameter, must be composed either of fluid or gas, for it does not transmit some earthquake waves that pass through any form of solid matter. This core is enclosed in a thick, hot, heavy shell, which is composed of native iron alloyed with nickel, and contains smaller quantities of other metals and of those constituents which form the ordinary rocks of the crust. This shell of nickel-iron is about 3,000 miles in thickness, and therefore forms the main mass of the earth. From the weight of its material it is known as the barysphere, or heavy sphere. It is kept rigid and solid by high pressure in spite of its intense heat.

Above the barysphere lies a comparatively thin zone composed of a mixture of the metals of the barysphere with the earthy minerals that form the crust. This ore zone passes upwards into the rocky crust, or lithosphere, which is probably from 150 to 200 miles in thickness. The material of the crust was formed as a slag by the lighter earthy materials of the barysphere floating upwards and thus becoming separated from the heavy nickel-iron and its associated metals.

The rocky crust consists of two chief groups of constituents. One group is made up of minerals which are light both in color and in weight, and form such rocks as granite. The second group includes more magnesia, lime and iron, and its rocks are, therefore, heavier and darker in color; they are the chief source of the iron in the ores of the crust. The rocks of the lithosphere contain in their pores water and gases, which tend to escape to the surface through deep-seated springs, gas vents and volcanoes. The steam which has been discharged from the interior is condensed into water and collects in the hollows on the surface, forming the oceans, lakes and rivers, or lies as groundwater underground.

All the water on or near the surface is regarded as forming another shell around the earth and is known as the hydrosphere, its average depth being two and a half miles. Above it lies the outermost or gaseous envelope, the atmosphere, about one hundred and fifty to two hundred miles thick.

The separation of the earth into these six divisions was completed before the beginning of geological history.

Geological time is divided into four major divisions known as eras, which are sub-divided into periods, and they in turn into epochs. The three last eras are distinguished by the kinds of life which dwelt on the earth during them.

The oldest of the three is the Era of Ancient Life, the Palaeozoic; the Era of Middle Life is the Mesozoic; the Era of Recent Life, or Cainozoic, includes the present age in which we live.

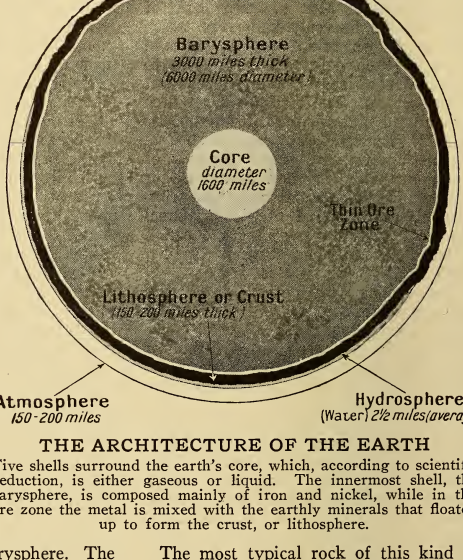
In the era before the Palaeozoic the world was inhabited only by archaic or-

ganisms, and it is sometimes called the Archaean or Archaeozoic Era, though these terms are used in such different senses that they are ambiguous. It was the era of the first life on the earth; so, adopting Plato's term for the primeval, we may describe it as the Pampalaeozoic or Primeval Era.

The older Pampaleozoic rocks form the bulk of the earth's crust and are the foundation on which all the later rocks rest. The most typical were formed at a high temperature and under great pressure deep below the surface. They are associated with beds of altered limestone, sandstone and clays, which indicate that even at that early time the general conditions which now exist on the earth already prevailed. Further, the thick beds of limestone and the seams of graphite, which were probably derived from primitive plants, suggest that even at that early date the seas were occupied by swarms of animals and plants.

During this first era the earth was much larger and less compact, and its crust thinner than it is now. The earth was then contracting comparatively rapidly, as its materials were being welded by heat and pressure into the compact mass of the barysphere. The skin of an apple which shrinks as the pulp dries and shrivels is thrown into folds; so the rigid crust of the earth is wrinkled and folded when it is forced into a smaller space by the shrinkage of the matter in the interior. Hence all the primeval rocks that were laid down as horizontal beds on land or sea have been since disturbed and tilted.

The later rocks are also tilted; but with them violent tilting is restricted to belts in the crust, whereas in the older Pampalaeozoic Era the whole crust was corrugated by the contraction of the interior. The crust, however, was gradually thickened by folding, by the addition of layers below through solidification, and by deposition of beds of sediment on the surface. The crust, therefore, became stronger and more stable; and some rocks of the later part of the first era are so little altered that they give clear evidence of the geographical conditions on the earth's surface when they were formed.



THE ARCHITECTURE OF THE EARTH

Five shells surround the earth's core, which, according to scientific deduction, is either gaseous or liquid. The innermost shell, the barysphere, is composed mainly of iron and nickel, while in the ore zone the metal is mixed with the earthly minerals that floated up to form the crust, or lithosphere.

The most typical rock of this kind is a coarse-grained red sandstone which forms extensive areas in North and South America, Scandinavia, India, Australia and Africa, and is conspicuous in northwestern Scotland. It there forms the Torridon mountains, from which this division is known in Britain as the Torridonian. The grains in the Torridon Sandstone are often beautifully rounded and polished like sand which has been rolled about by the wind in modern deserts. Many of the pebbles in the sandstone have flattened, straight-edged

surfaces like the facets of a gem. It was sand, blown against the pebbles by the wind, that cut these surfaces. Such primeval sandstones were formed under desert conditions, and the materials were moved and sorted by wind.

The great difference between the surface of the earth then and as we know it was due to the absence of turf. The rock and soil were not protected from the attack of rain and wind and water by a mantle of plants. Accordingly, the loose, shifting sands which characterize the desert of to-day then covered the whole land. The prevalence of shifting sand does not indicate that a dry climate was then universal, but that the loose earth was not held in place, and the rocks not protected, by a carpet of vegetation.

The Torridon Sandstone has yielded no definite fossils, but that living beings were then in existence is proved by the fact that some grains of phosphate of lime containing grooves or canals, which must have been caused by organic agencies, have been found in this sandstone beside Loch Broom in north-western Scotland.

Evidence of early life on a larger scale is supplied by the thick sheets of limestone which occur among the primeval rocks in many parts of the world. Now, it is true that some limestones are formed by purely chemical processes, and that, owing to the alteration which the primeval limestones have undergone, the evidence whether they were deposited chemically or by the action of life has been destroyed; but this evidence exists clearly in other cases. Most limestones are undoubtedly formed by animals or plants, and the Pampalaeozoic limestones agree in arrangement with those formed by organisms at later geological dates.

The earth before the Pampalaeozoic Era must have been intensely hot, and was, perhaps, molten. Hence it was natural at first to think that when the earth was young its climate must have been uniformly warm and moist. Neverthe-

ROCKS FOLDED AND WRINKLED IN THE ERA OF PRIMEVAL LIFE

The earth was contracting comparatively rapidly during the first era of its history, the Pampalaeozoic or Primeval, and the rigid crust crinkled as it was forced into smaller space by the shrinkage of the barysphere. Primeval rocks, laid down as horizontal beds, became tilted and folded like the black slates and limestones seen here; and this process served to thicken and strengthen the earth's crust.

Photo, Geological Survey and Museum

less, the oldest known rocks afford clear evidence that during their deposition glaciers existed in parts of the world which are now too hot for them. The hills in South Australia that rise behind Adelaide and extend northward towards Lake Eyre contain beds of conglomerate with huge ice-worn and ice-scratched boulders, like those carried down mountain sides by modern glaciers. These South Australian conglomerates were deposited by ice as long ago as the Primeval Era; yet they actually extend into the tropics. Glacial deposits of about the same age occur in central China in part of the river basin of the Yangtze Kiang, a region which now has a hot, tropical summer.

The primeval rocks form the foundation on which all the later rocks have been deposited. They are exposed at the surface in vast, massive blocks, most of which have remained above sea level throughout geological time. These blocks, or coigns, form the world's corner-stones, which have conditioned earth movements and the course of mountain chains in later times. The coigns of primeval rocks include some of the great existing highlands and uplands: one of them forms Scandinavia and Finland, and the Scottish Highlands were once a part of it; Labrador, with the adjacent parts of Canada and the United States, is another. Manchukuo with the adjacent parts of Siberia, the peninsula of India, equatorial Africa, Brazil and Western Australia are other coigns. The primeval rocks, in addition to forming these vast blocks, occur on the surface in long strips like that on the south-eastern coast of China, and in the axis of many mountain chains.

The rocks on the original surface of the earth were all of the kind which are known as Primary, because their constituents are used as rock material for the first time in geological history. These Primary rocks are formed directly by the solidification of molten matter. They are of two chief kinds—those formed deep below the earth's surface, such as granite, and those, such as lavas, which solidify on the surface.

When rocks are exposed to the action of water, rain and wind, and of changes of temperature, and to the attack of the gases in the air and of acids set free by decomposing vegetation, they begin to crumble and decay. The rock débris due to these processes is washed down the hillsides, and spread at their feet as beds of rain-wash or carried farther away by streams and rivers. As the rivers reach level country and their currents become less swift, the sediment they carry is deposited in the quieter parts of the channel or on the adjacent plains.

The larger pieces of stone make beds of gravel and the finer material sheets of sand and clay. The carbonate of lime dissolved in river water may be precipitated and, when cemented, form limestone. The loose materials are ultimately cemented into Secondary rocks, which are so called because their constituents are used as rock for the second time, having already occurred as the material of Primary rock. Secondary rocks form the bulk of the upper part of the earth's crust, the most abundant being sandstones, clays, shales and limestones.

When life first appeared on our earth and how it developed here may perhaps never be discovered, for the evidence may have been completely destroyed. Lord Kelvin suggested that life was first brought to the earth by a spore lying in a crack in some meteorite, but that suggestion merely refers the difficulty to another sphere. No known heavenly body is, so far as we know, more suitable for the development of life than the earth. Another way of avoiding a solution of the problem is by the assumption that the distinction between the living and the dead is absolute, and that life can only have been formed at a definite moment by a direct creation.

The fact that no satisfactory definition has been framed which separates living and non-living materials suggests that there is no absolute difference between them. The most obvious distinction depends on chemical composition. Living material consists of protoplasm, the chief constituent of which is a compound of carbon, hydrogen and oxygen in the proportion present in such materials as starch, which are known as carbohydrates. They are usually formed by organisms which cause the carbon dioxide of the atmosphere to combine with water, and

the conditions in some places on the early earth, e.g. the muddy shore of a lagoon, would have been very suitable for their chemical formation. The earth would then have been covered by a dense cloudy atmosphere, which admitted sunlight, but prevented chilling at night, and thus ensured a practically unchanging temperature. The carbon dioxide in the air, which may have been discharged into it from hot springs, would have united with water vapor to form a jelly composed of carbohydrate. This material would have absorbed nitrogen from some compound of ammonia, and by the interweaving of the constituents into a more complex structure have produced proteins, the main constituents of living matter.

Hence on the shore of the primeval world, in the warm mud beside a lagoon, with an unchanging temperature and in an atmosphere of a more complex composition than that of the present day, the action of sunlight may perhaps have produced, by purely physical processes, a carbohydrate and ultimately protein. This protein jelly would not become alive until it had acquired the power of absorbing food, of growth and of reproduction.

The absorption of food may have begun as a purely mechanical process. Plant-like structures can be grown from artificial seeds, and these artificial plants imitate the complex forms of vegetation by purely inorganic and mechanical processes. Later experiments have made structures which are claimed to reproduce the properties and movements of an organic cell.

The repair and renewal of parts is a power shared with organisms by crystals, which retain this power with far greater persistence than animals. Thus a crystal may be broken, and if aeons afterwards it be fed with suitable material it will grow again, replace the broken portion and fill up cracks in perfect optical continuity with the pieces of the original crystal.

As for reproduction, this process is a necessity due to the mechanical limitations of the size of structures, limitations which effect both the mineral and organic kingdoms. The constituents of a mass of granite, for instance, which is solidifying under uniform conditions in the interior of the earth, might be expected to grow into crystals of gigantic size; but the usual crystals in granite are not more than an inch or two in length. As soon as they have reached that size their growth stops and fresh crystals form.

Hence there is no impossibility in the formation of a primitive organism by purely chemical and mechanical processes. This hypothetical first-formed and simplest of creatures has been named protobion. Its development into the protozoon, the most primitive of existing animals, would have followed the acquirement of greater activity and the eating of solid food instead of absorbing nourishment only from solutions. The simpler protozoa, during the creeping forward of their plastic bodies, come against a particle of food and flow around it. Any part that cannot be used as food is left undigested and ultimately expelled, just as a crystal selects from a solution the materials it needs for its growth and leaves the residue as "undigested" extraneous particles.

The power of absorbing food as the result of movement stimulated the protozoa to more active life, and with this mobility they began to react more quickly to impulses—an increased sensitiveness which led to the development of instinct and intelligence.

Another line of development was that of defence by attaching sand grains to the outer surface of their soft bodies, thus forming a primitive shell. Subsequently more elaborate shells were formed by the secretion of silica or carbonate of lime on the surface of the body.

When the cloud belt which surrounded the early earth was removed by chilling and condensation, the organisms had to adapt themselves to changes of temperature and to the passage from brilliant sunshine to the darkness of night. The changed environment rendered the processes by which a simple inorganically-formed carbohydrate developed into living matter no longer possible. Accordingly, it is only the life supposed to have been formed in the Primeval Era that has since given rise by slow evolution to all the highly-specialized modern animals and plants.

If an observer from another planet had watched the world from outside during the dawn of the Primary Era or Era of Ancient Life, he would have noticed no such fundamental physical difference in the condition of the earth as that which marked the beginning of the Primeval Era. In the early part of primeval times he would have seen the earth surrounded by a thick, steamy atmosphere, through occasional breaks in which he might have seen a red glow from the heated surface of the earth, just as the glow of hot lava from an active volcano slate and sandstone, which formed broad uplands. The most momentous change was in the nature of the animals and plants. During the preceding time the seas had been occupied by a rank growth of small water plants which formed the food of soft-bodied sluggish animals. The decay of this mass of organic matter probably gave the atmosphere the rank odor of a tropical forest or the evil smells which persist along a shore of mud flats.

In the first section (the Cambrian) of the new era the life was more varied and active. Innumerable worms burrowed

ROCK MASSES THAT FORMED THE PRIMEVAL WORLD'S CORNER-STONES

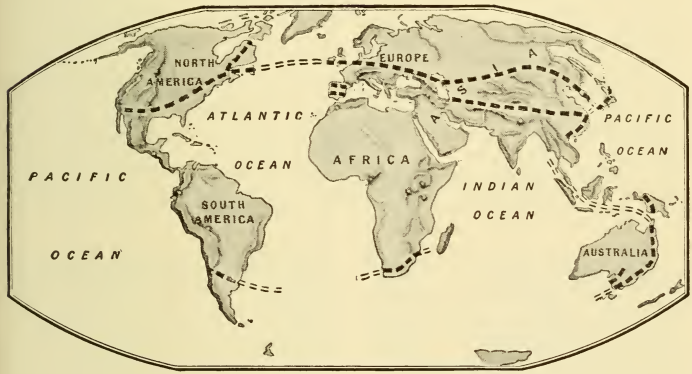
These vast masses of primeval rock were the greatest importance in the building of the world. They have controlled earth movements and (as we see by comparing this map with that in the opposite page) the courses of the mountain chains of modern times, in some cases forming the axes of them. Throughout geological time these primeval highlands have seldom been beneath the sea.

may be seen through rifts in the clouds. During the later part of primeval times, however, the earth would have cooled down and lost the visible signs of heat; the condensation of the clouds would have enabled the observer to see large parts of the surface and the existence of continents occupied by red sandy deserts.

The passage to the Era of Ancient Life was not accompanied by any marked difference in the physical appearance of the earth. The predominant rocks were hard sandstones which stood up in long mountain ranges, and masses of slate, or of through the sand of the shallow parts of the sea floor and along the shore; the mud banks were the homes of shellfish similar to those that still live on the coast of Florida. Large numbers of shells lay on the sea bed, some with two valves like a mussel, and others with coiled shells like snails. There were also shellfish with head and tentacles like the nautilus; but instead of the shell being rolled into a coil, it was a long straight rod. This shell would sink into soft mud, or when the animal swam backwards, by squirting water through a vent beside

its mouth, would cleave its way through the water like the ram of a steamer.

The most notable of these early animals, the Trilobites, are now extinct; they had on the under side many jointed limbs, while the upper part was protected by a carapace or crust, from which the whole group of which the Trilobites are members is known as the Crustacea. The most familiar living Crustacea are the shrimps, lobsters and crabs. The Trilobites were the most specialized and highly living at the time of the oldest known fauna. The second division consists of animals which are built up of many cells and of different kinds of cells, but which are without a backbone. This division includes eight sub-divisions: the sponges; hydroids and jelly-fish; anemones and corals; sea-urchins, starfish and sea lilies; worms; jointed-limbed animals (Crustacea, insects, etc.); Bryozoa and lamp shells; and, lastly, shellfish. All these eight groups are represented in this old-



HOW TIME HAS AFFECTED THE MOUNTAIN RANGES OF TODAY

The formation of mountain ranges helped to prepare the earth for Man. The primeval rock masses were constantly eroded by rain and wind, and this process was considerably expedited by the continual upheavals to which they were subjected, since these exposed new surfaces to the weather. The débris washed down the slopes and the volcanic material spread abroad by eruptions formed soil and regularly re-fertilized it.

developed organisms in the Cambrian seas, and were so characteristic of it that it is known as the Age of Trilobites. In contrast to these active animals were the primitive corals which formed reefs in some of the Cambrian seas.

The first striking fact in regard to the life of this early period is that so many different groups of animals were already in existence. The animal kingdom is divided into three categories, of which the simplest, the unicellular animals, consist only of a single cell, or of groups of cells all of one kind. These animals, being the most primitive, were naturally est fauna, and by highly specialized animals in which the characteristics of each group are well developed. The third primary division of the animal kingdom includes animals with a backbone, and no representative of it is known in the Cambrian or until the Silurian period.

In accordance with the now almost universally accepted doctrine of evolution, all the Cambrian animals were descended from one common ancestor through a long process of development, which must have taken aeons of time. The length of time between the beginning of the Era of Ancient Life and the present day is

now generally estimated at 1,500 million years, or perhaps several thousand millions of years. This, at least, is in accordance with the evidence of the radioactive rocks. Nevertheless, it is often considered that the development of this Cambrian fauna would have required a period as long as that between the Cambrian Era and the present day.

It long surprised geologists that they could find no trace of the ancestors of the Cambrian fauna in the rocks of the preceding era. Many of those rocks would have preserved as fossils any shells or corals embedded in them, and the absence of fossils shows that no animals then in existence had parts hard enough for preservation as fossils. There must have been some change at the beginning of the Era of Ancient Life which led many kinds of animals simultaneously to develop shells or other means of defence.

The first animals lived upon vegetable food, and while they were all vegetarians, shells and other defensive structures were needless. At the end of the Primeval Era one class of animal, probably the ancestors of the Trilobites, acquired a taste for an animal diet. Food was then so abundant and defenceless that the carnivorous creatures doubtless grew quickly in numbers and strength, and soon became dominant. Their continued increase threatened the extermination of forms of life which could not adapt themselves to a "safety-first" policy. Some of them gained security by burrowing in the mud; others, such as the sponges, rendered their soft tissues noxious as food by the growth of spicules or sharp spines, which would have irritated the mouth or digestive system of any animal that devoured them. Others enclosed their soft parts in hard shells, which were composed of a pair of shields or of a tube which was generally coiled into a spire or disk. Some animals adopted an armor of overlapping scales; and others maintained existence by acquiring powers of swift movement.

The sudden appearance of so many groups of highly-organized fossils at the beginning of the Era of Ancient Life is not, therefore, evidence of the sudden appearance of life, but only of the first development of shell-bearing animals.

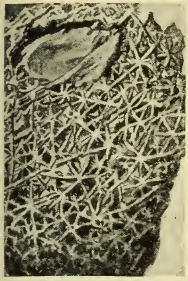
The second period in the Era of Ancient Life was the Ordovician, characterized in the British Isles by intense volcanic activity. Towards the end of the period volcanic action broke out with renewed intensity, and Snowdon was built up as a great volcano. The harder rocks of Snowdon are mostly lavas, and they are interbedded with layers of volcanic ash ejected during the eruptions. It has been pointed out that the volcanic ashes are most abundant on the north-eastern side of these volcanoes, so that the prevailing wind then, as now, blew from the south-west. The ordinary rocks laid down in the Ordovician seas included much finer material than those characteristic of the Cambrian. The commonest are coarse sandstones and grits, and these in many parts of Britain are thousands of feet in thickness. In the central part of the southern uplands of Scotland the Ordovician system is represented chiefly by bands of black slate.

Probably in Ordovician times a mountain range crossed Scotland from Aberdeenshire into the southern uplands and there formed a high coast from which the drainage flowed first inland and reached the sea to the north-east or north-west. The coast to the southward projected in bold headlands; the bays between them received but little coarse sediment, and their floors were covered by fine mud since compressed into black slate.

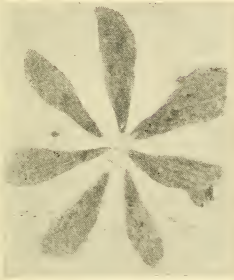
Meanwhile, the west of Scotland was occupied by a great valley which reached the sea near the present Firth of Clyde. The mud and sand from the northern land were swept into this estuary, and deposited as thick beds of sand and clay. The land which then provided the abundant sediments doubtless extended eastward to Scandinavia and Finland, and westward right across the Atlantic to the north-east of America. The limestone of Durness in the north-western corner of Scotland was deposited in the sea to the north of this land. The fossils in that limestone are so different from those of the Ordovician rocks of the south of Scotland, the English Midlands and Wales that the seas to the north and south of this land must have been completely separated. Hence the Ordovician fossils of the north-west of Scotland are allied to

those of far distant localities in the eastern United States, and are strikingly distinct from contemporaneous forms that lived near by in the rest of the British Isles, or comparatively near by, in western Europe.

The Ordovician period was brought to an end by earth movements which led to a great change in the geography of the British Isles and the North Atlantic. The period just ushered in is called the Silurian, and is marked by the first appearance of backboned animals. Its earliest deposits were thick beds of coarse sandstone and shales laid down in a shallow sea; but, later on, the sea was enlarged, so that the few animals which lived in it at the early part of the time gave place to a much richer and more varied fauna. Wales and the western Midlands were

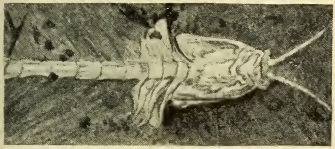


Globular sponge



Jelly-fish

Starfish



Cambrian crustacean

Middle Cambrian worm

Cephalopod shell

Cambrian coral

Lamp shells

SCARCE ALTERED FOR MILLIONS OF YEARS: TYPES OF CAMBRIAN LIFE

Backboneless animals, excluding the great class of unicellular organisms, may be divided into eight categories; and what is most striking about the Cambrian period (the first to contain fossils) is that all of them are already found represented in its rocks. Another fact to impress anyone who studies this group is the small change that each has undergone in the millions of years that separate them from today. Notice, too, how a soft creature like a jelly-fish has had its outline preserved.

covered by an inland sea, of which the only outlet lay to the south of Ireland. Its water was not that of the open sea, and comparatively few animals were able to live in it, until the connection to the ocean had been enlarged. This change happened during the Silurian Age and the temperature was raised by the entry of warm water, blown by the wind from the south-west. The English sea was warmed by this current and was cut off from the cold northern water by the emergence of land to the north-east. The temperature of the sea over the Welsh borderlands during part of the Silurian period was subtropical, and coral reefs built up a bed of limestone which is today the 40-mile-long ridge called Wenlock Edge. In this sea lived luxuriant groves of sea lilies, whose remains contribute so largely to some limestones that the Silurian has been called the Age of Sea Lilies.

The advance of the sea upon the land was not limited to the British Isles. It is a feature of the Silurian period throughout the world. Geologists at first imagined that the interchange of land and sea was local and irregular, subsidence in one place coinciding with uplift elsewhere, but it was pointed out by the Austrian geologist, Eduard Suess, that at various times of geological history the sea made a world-wide advance upon the land. These "marine transgressions" were due to redistribution of the water, independent of the continuous increase in volume.

Time after time, as the earth shrank in size, there were widespread upheavals and sinkings of the surface. An upheaval of the floor of an ocean makes its basin shallower, and the water displaced advances on the land, submerging low coastlands in all parts of the world. This movement may be succeeded by a fresh deepening of the ocean basins, which are filled up by the flow of water into them, so that the coastland again emerges. The great transgressions are due to the advance and retreat of the sea, and not to the rise and fall of the land that has undergone submergence and emergence.

That the contraction and expansion of the Silurian seas were due to relatively quiet earth movements is indicated by the comparative rarity of volcanic eruptions. Volcanic action had ceased in the British Isles and most parts of the world enjoyed volcanic rest.

During this Silurian period animal and plant life continued to develop, and made three important advances. The Silurian affords the first direct evidence of land plants, which are represented by seeds or spore cases found in the upper beds. The development of land plants rendered possible the existence of insects, and the oldest known remains of them are Silurian.

The most important development of the period was, however, the first appearance of the vertebrates, or animals with backbones. They were then represented by the first certain fossil fish, and belonged to primitive types such as the sharks. They found food so abundant and easily caught that their numbers waxed exceedingly, and a bed composed of fossil fish bones was laid down over an area of about 1,000 square miles in the Welsh border countries alone. (From this point the story of vertebrate life is taken up in the chapter in later pages by Professor D. M. S. Watson entitled, "Life on Earth Before Man").

At the end of the Silurian period its quiet earth movements gave place to violent disturbances. The crust of the earth, having become thicker and more rigid, no longer contracted by general folding; the crust resisted compression until it yielded along relatively narrow belts, which underwent intense dislocation. Large slabs of rock were pushed over one another like tiles on a broken roof.

The correct interpretation of areas where old rocks have been pushed sideways above younger rocks proved very difficult. The position of old above young appears inconsistent with the fundamental principle of geology that in a series of rocks the lowest are the oldest. And, indeed, this principle always does apply except where the beds have been overturned by folding, or by slabs of rock having been pushed sideways along planes of movement known as thrust planes. The extent of such movements was first realized by the study of north-western Scotland, where a belt of rocks eighty miles in length from the Pentland Firth to Skye has been pushed westward for a distance in some places of

ten miles, and hence the movements and the resulting mountains are known as Caledonian.

The period that followed is known as the Devonian. Now the Caledonian movements had led to a further withdrawal of the sea from northwestern Europe, and a continent which included Finland, Scandinavia and Scotland extended across the Atlantic to eastern America and as far north as Greenland and Spitsbergen. The same movements had produced many mountains in this northern land; rivers that flowed from them washed down vast quantities of sand and pebbles, which were deposited in the valleys and formed wide plains. The rivers flowed across these plains along meandering courses that were constantly changing.

Their beds were raised by deposits of earth and stones carried down from the hills during floods. When the bed reached a certain height the river was forced to choose a lower course, until that in turn was raised above the general level, and the river again diverted. The rivers were mostly shallow; after heavy rain in the mountains they were wide and swift; but during dry seasons they dwindled to insignificant streams. They were similar to those known in New Zealand as "shingle rivers," which, flowing from the New Zealand Alps, have deposited fan-shaped sheets of sand and gravel—the Canterbury Plains, extending from the mountains to the coast.

Across these far-spreading plains the rivers flow along bands of shingle miles in width, and through constantly changing courses. Bends of the river are often cut off as lakes, and when this happens their water is lost by evaporation or sinking underground. The fish are crowded into the last of the pools, and then deposited in the mud on its floor. If the dried lake be next covered by clay blown across by the wind, they may be preserved as a fossil fish bed.

The Old Red Sandstone (which, with the Devonian rocks, occupies the interval between the Silurian and Carboniferous periods) was formed under some such conditions. It consists mainly of coarse sandstones, most of which include no fossils; but occasional layers of clay and flagstones are crowded with fossil fish or contain a few freshwater shells and land plants. The fossil fish are so closely packed in some beds that they must have been collected into pools from wide tracts of water. No trace has been found in the Old Red Sandstone of marine animals, so the beds must have been laid down in fresh water. The pebbles along these ancient river beds show frequent signs of erosion and polishing by the action of blown sand, proving that they were often left for long periods exposed to the force of the wind.

The fish of the Old Red Sandstone were so predominant, so varied and some of them so large, that the Devonian is sometimes known as the Age of Fish.

The Old Red Sandstone also marked a great advance in the life on land, as then, for the first time, the ground was covered by continuous sheets of vegetation forming turf. The shifting sands that were probably universal in pre-Devonian times were subsequently limited to deserts and sand-dunes. The rest of the land soon became covered with a mantle of vegetation, which rendered it a suitable home for specialized animals that had previously been restricted to the sea and to lakes.

The Devonian period was brought to an end at first by a rise of the sea, and then by subsidences which led to the submergence of much of the Old Red Sandstone land. In the sea was deposited a thick sheet of grey limestone, which, as it forms some of the better-known English mountains, was called the Mountain Limestone. It is now generally known as the Carboniferous Limestone, being the first important member of the Carboniferous System, which includes most of the world's chief coalfields.

The characteristic features of the world in the Carboniferous period were the wide extent of the lowland plains on which the coal forests grew, while the mountains were unusually low. During the earlier part of the Carboniferous period mountain uplifts were unimportant, and the high country was steadily planed down by rain, rivers and frost, while large areas sank in mass to lower levels. The general levelling of the

surface and the intermingling of land and water, due to the seas extending far into the lands, gave the world as a whole a warm and moist climate with only moderate variations between heat and cold. The plains and inland basins were covered by luxuriant forests, which were buried and preserved as coal seams owing to the sinking of the land.

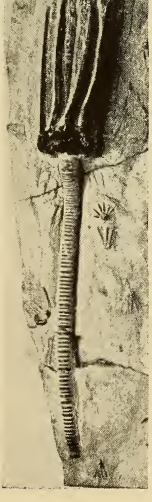
The differences in climate between winter and summer, between the tropics and polar regions, and between the coastlands and the interior of continents, were less extreme than they are to-day, for the lowness of the mountain ranges deprived the world of the chilling effect of the highland snowfields, and lessened the contrast between the well-watered outer slopes of the continents and the dry basins within. The climate of the whole world was not uniform, for there is ample evidence that the regions round the poles were colder than the central zone. These climatic conditions have rendered the Carboniferous formations the main storehouse of the world's coal, and of much of its oil.

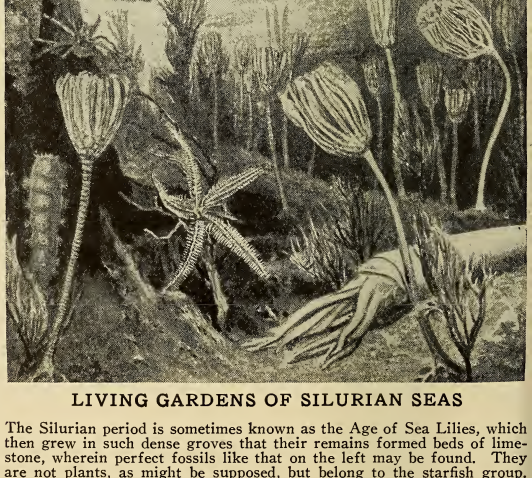
The same geographical factors also led to important developments in the life of the world. The forests provided food and shelter for land animals, while the conditions of the sea were favorable to marine life.

The most important advance of life in the Carboniferous period was the first appearance of quadrupeds. They belonged to the class of amphibians—now represented by frogs, toads and newts—and their development, after the adoption of a lung-breathing habit by some Devonian fish, probably followed the growth of land vegetation, which provided abundant food supply and shelter.

The five previously mentioned periods of the Era of Ancient Life take their names from British formations, and they were defined by work on British geology. The sixth and last period of that era takes its name from the province of Perm, in eastern Russia; its history and rocks offer a striking contrast to those of the Carboniferous.

The differences between the Carboniferous and the Permian systems were due





LIVING GARDENS OF SILURIAN SEAS

The Silurian period is sometimes known as the Age of Sea Lilies, which then grew in such dense groves that their remains formed beds of limestone, wherein perfect fossils like that on the left may be found. They are not plants, as might be supposed, but belong to the starfish group.

Photo, British Museum; reconstruction after Charles R. Knight

mainly to the influence of the movements of the crust. The gentle movements during the Carboniferous were succeeded by quicker subsidences accompanied by vast volcanic eruptions. The crust of the earth had become too big for the interior, and was reduced by the sinking of large areas and the crumpling of the intermediate bands into fold-mountain chains. They are often known as the Hercynian mountains, but Altaid, from the Altai mountains of Central Asia, is more definite and descriptive.

The Altaid mountains trend roughly east and west across Asia to the north of the younger mountains of the Himalayan system. The Altaid system is continued in Europe, north of the Alpine mountains; it includes the chief highlands of central Germany and the hills of Brittany, Cornwall and Devon and the southwest of Ireland. In America the Altaids are represented, amongst others, by the Appalachian mountains, and in Australia by the ancient mountains of which the worn stumps form the existing Eastern Highlands.

WHY OLDER MAY COVER YOUNGER ROCKS

The great Caledonian disturbances that closed the Silurian Period were caused by crust shrinkage, and involved the thrusting of adjacent strata one over the other. Sometimes older rocks were superimposed on younger, as here in Ross-shire in Scotland, where Torridon Sandstone (the darker areas) overlies later quartzite.

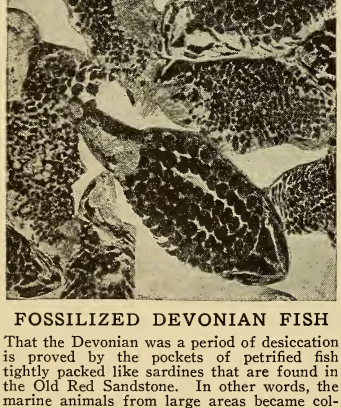
Photo, Geological Survey and Museum

These Altaid mountains were upraised in the latter part of the Carboniferous and in the earlier part of the Permian by one of the greatest mountain-building convulsions in the history of the earth. They were probably as high and as continuous as any on the earth at the present time. These lofty chains produced great local differences of climate. Vast snowfields formed upon their higher slopes, and fed glaciers that flowed down to sea level. Where the glaciers reached seas that were separated from the tropical waters, the ends of the glaciers floated away as icebergs and dropped huge rocks on the sea floor.

The winds from the sea dropped all their moisture as rain and snow upon the mountains, and their effect farther inland was dry and parching. The air falling down the inner slopes of the mountains was also heated by compression, just as air becomes warm in a bicycle pump. This hot, dried air withered the meadowlands of the Carboniferous period into dry plains with the scanty vegetation of steppes, and their scattered tufts of vegetation in time disappeared, leaving only desert. The rivers dwindled in volume, and were no longer able to keep their channels clear by removing the sand blown into them by the wind; thus the river valleys were broken into chains of lake

basins. The water in the lakes was concentrated by evaporation and became salt; and if they completely dried up, all the material dissolved in the water was deposited on their floors.

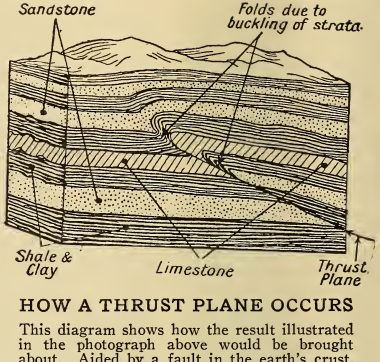
Arms of the sea were often cut off from the ocean as lagoons; and as their waters were reduced by evaporation, the mineral constituents were deposited as gypsum and common salt. At one time the whole of the water in the inland sea that covered Germany and extended to the English midlands was lost by evaporation, and the salts of potash and magnesium which remained in the final brine, or bittern, were deposited in the deeper basins. Hence central Germany includes not only vast beds of gypsum and salt, but also the main store of the potash salts available for use as manure. Agriculture, therefore, owes to the desert conditions of the Permian period one of the chief materials needed for the re-fertilization of exhausted soils.



FOSSILIZED DEVONIAN FISH

That the Devonian was a period of desiccation is proved by the pockets of petrified fish tightly packed like sardines that are found in the Old Red Sandstone. In other words, the marine animals from large areas became collected into the last remnants of drying lakes or seasonal rivers and there expired.

British Museum, Natural History



HOW A THRUST PLANE OCCURS

This diagram shows how the result illustrated in the photograph above would be brought about. Aided by a fault in the earth's crust, the strata on the right were slid by lateral pressure over their neighbours.

The peculiar conditions of the Permian period also led to the formation of some important ore deposits. The wearing down of the mountains exposed lodes of copper, lead and zinc, and grains of these ores were washed down the mountain sides and deposited in beds of sand and sandstone. These grains were subsequently dissolved by water percolating through the sandstones and re-deposited as copper and lead ores, which also contain silver, zinc and cobalt.

The rocks formed in the Permian deserts of north-western Europe were predominantly coarse sandstones with beds of shale laid down by occasional floods of water after bursts of rain, and thicker shales associated with salt and gypsum on the site of vanished lakes and lagoons. In other parts of the world the Permian rocks are more extensive and less abnormal. Thus, in Russia, northern India, south-eastern Asia and Australia the Permian System is represented by three different subdivisions and includes many marine rocks deposited in the open sea. The classification of the Permian System has, therefore, to be determined in those lands.

During the later Carboniferous and Permian periods the southern hemisphere had an arrangement of land and water quite different from that of the present day. There were in the world two great continents, each of which had its own

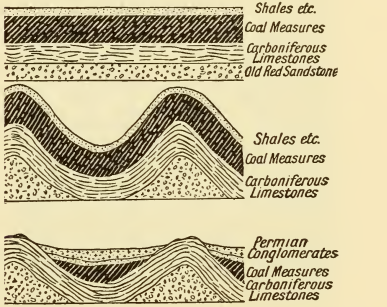
special vegetation. The northern continent extended from Asia across Europe to North America; the southern continent, which is known as Gondwanaland, included most of Australia, India and Africa and the whole of Brazil, and it extended across both the Indian Ocean and the South Atlantic. The extent of the southern continent is proved by its flora, of which the characteristic member resembled a tree fern, known as *Glossopteris*. It and its associated plants range from eastern Australia to western Brazil. The northern land was occupied by a different vegetation, which is well known, since the trunks, foliage and roots of its great forest trees are found with smaller plants in the coal seams.

The geographical changes which converted the rank forests of the Carboniferous period into the deserts of the Permian produced also a great change in the life of the world. The deepening of the ocean basins at one time and their shallowing at another led to great changes in the distribution of ocean and continent and in the conditions of the sea water. Many highly specialized and decrepit types of life were exterminated, as they could not readily adapt themselves to their new environment, while the stimulus of the change led the more adaptable creatures to rapid evolution into new types. Hence during the Permian period many animals characteristic of the Era of Ancient Life, such as the Trilobites, became extinct, and others were continued by modifications adapted to the fresh conditions.

On the life of the land the geographical changes were still more influential, and their stimulus led to the evolution of the reptiles. The original change from the land-living amphibian to the reptile was a comparatively simple stage and had probably been made while the Altaid movements were in progress, for when the deposition of beds was resumed in Britain, the earliest of them contained the teeth and bones of reptiles.

After that change the reptiles soon developed into many different kinds, and in the next period, the Triassic, one section of them gave rise to the mammals. The change in life was so important that the end of the Permian period marks the end of the Era of Ancient Life and the beginning of the Era of Middle Life. That great advance in the earth's history is marked at the divide between the Permian and the Triassic.

Still more extreme became the desert conditions of north-western Europe and of parts of eastern North America during the Triassic period, and it was then that the most important of the British salt beds were formed. The Permian inland sea disappeared, and the sea in Europe was limited to the Mediterranean area and the Southern Alps, except for a short extension northward in the middle



HOW OUR COALFIELDS WERE SAVED

When at the end of the Carboniferous period the crust became folded into ridges, most of the Coal Measures were lost through denudation and only those preserved that lay in the pockets of the hills. They are now covered again with later deposits.

of the Trias into central Germany. Numerous salt lakes were in existence, and they probably received their salt from the solution of Permian beds. The evaporation of the lakes produced the salt deposits which have made Cheshire and the English Midlands the chief centres of the British chemical industries.

England's desert condition at this time was in all probability due to the continued existence of the Western Altaid mountains, which trended across Europe from east to west, and were continued across the Atlantic.

The succeeding period is known as the Jurassic. The deserts of the Trias were

gradually reduced in area by successive advances of the sea upon the land and the development of a moister climate. The submergence happened simultaneously in so many parts of the world that the only satisfactory explanation of the facts is that the ocean basins were gradually reduced in size by the raising of their floors. As the basins became shallower their water was forced to spread on to the land. These widespread marine transgressions happened time after time throughout the two later periods of the Era of Middle Life. The red clays of the Trias pass gradually upward into green and dark blue shales, which contain marine shells.

In later times, after the submergence of the land, large tracts of country were covered by a clear warm sea, in which grew coral reefs and shellfish, whose remains have accumulated as beds of limestone. Some of these limestones consist of small rounded grains, so that they look like the hard roe of a fish, and are, therefore, known as roestone, or oolite (from Greek *oon,* egg; *lithos,* stone); these oolitic limestones provide some of the most ornamental of English building stones. On some of the muddy floors of the sea small grains of carbonate of iron were formed, and they have in places accumulated as beds of valuable ore; the oolitic ironstones of Cleveland in Yorkshire provide the raw material for the iron industry of Middlesbrough, while the ironstone of the same age in Lorraine forms the largest reserve of iron ore in Europe. The system which includes these oolitic limestones and ironstones derives its name from the fact that its rocks are well developed in the Jura mountains of Switzerland. In the Mediterranean and tropical seas the limestones are still more abundant.

In many parts of the world the end of the Jurassic period was accompanied by violent earth movements and volcanic disturbances, which were contemporary with a gentle uplift in the British area. A long belt of country in the western hemisphere was crumpled and formed the foundations of the western mountains of North America and of the Cordillera of South America. These movements were accompanied by great volcanic disturbances, while solutions arising along fractures in the crust brought up the gold of parts of western America.

When these disturbances ended there followed another time of fairly quiet development; it is known as the Cretaceous period, because its characteristic rock is the chalk, the white cliffs of which gave England its name of Albion. This period was attended by further transgressions of the sea upon the land, until the chalk sea extended across Europe from Ireland to the Crimea. The chalk deposited on the floor of this ocean supplies the world with vast quantities of soft earthy limestone, which is of great value for making Portland cement; while some layers in it contain phosphatic grains which supply phosphatic manures. Within the chalk were also formed nodules and veins of flint from which early Man made his tools.

Both the Jurassic and the Cretaceous period witnessed further progress in the life of the world. The dominant animals were the reptiles, which were supreme on land, in water and in the air. The mammals still remained small and unimportant, as they were unable to compete successfully with the powerful reptiles; but at the end of the Chalk period the mammals must have improved in wiliness, for they then replaced the reptiles as the dominant class of animals, while the birds, which developed later than the mammals, replaced the reptiles in the air.

At the end of the Cretaceous period there followed another of the great revolutions in the surface of the earth, leading to the Era of Recent Life. The break between the two eras was due to a world-wide disturbance, as the slow movements from the Trias to the Chalk had rendered the crust weak and unstable. It recovered strength and stability by rapid changes, during which blocks of the crust foundered, forming parts of the Indian Ocean and South Atlantic, and causing volcanic eruptions on a colossal scale. An area of about half a million square miles in and to the west of India was covered with lava, and at about the same time or shortly afterwards lava floods deluged eastern equatorial Africa and south-eastern Australia. The subsidences did not fully re-establish the equilibrium of the crust, and belts

of it were folded by compression into mountain chains.

The folding which made the Alps had begun gently during the Era of Middle Life, but the movements became more intense after the time of the Chalk, while the active upheaval of the Pyrenees and the Caucasus began somewhat earlier than the Alps. This disturbance of the earth's surface culminated in the middle of the Era of Recent Life, when a great crustal storm formed all the main existing mountain chains, including the Alps, Pyrenees, Carpathians, Atlas, Caucasus and Himalayas, and, by a further uplift, the chief mountains of western America also.

Following the compression of these narrow, intensely folded belts the principal movements of the crust were the gentle heaving of the surface as some areas of hard rocks were slowly raised into broad domes or long arches, and the adjacent regions sank below sea level.

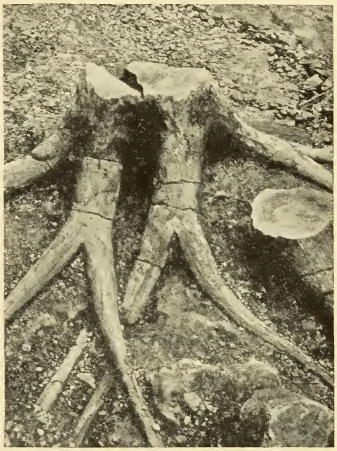
PETRIFIED CARBONIFEROUS VEGETATION

Fossil roots are sometimes discovered embedded in the ground beneath and attached to trunks that grew up through the coal seam, as at Clayton near Bradford, England, (upper photograph). Often the undergrowth of ferns has preserved a record of its structure by leaving impressions in the coal (lower photo).

Photo, Geological Survey and Museum

The upper surface of the uplifted areas was stretched and torn by networks of fractures, which now form the fiord systems of the world.

The great changes produced by the geographical revolution of the middle part of this era re-established great



differences in relief on the earth's surface, leading to great climatic extremes. At the beginning of the Era of Recent Life the range of level on most of the land was comparatively gentle, and the climatic differences were moderate. Many areas had a warmer climate than at present. The mouth of the Thames was then the estuary of a great river from the south, which flowed through forests of palms and was inhabited by crocodiles and turtles.

During the Era of Recent Life the climate of the British area became gradually colder. By the time of the great volcanic disturbances of the north-west of Scotland, which at Mull and Skye built up volcanic mountains as high as Etna—and over 10,000 feet above sea level—the palms had been replaced by trees which live in a colder zone. Shells that now inhabit only warm water still lived in the south of England, but they disappeared one by one and were replaced by shells of a northern type. The

long-continued, gradual refrigeration of the climate culminated in the Great Ice Age, during which there was a great extension of snow fields and glaciers in many parts of the world. The snow on the British mountains fed glaciers which flowed down the valleys and in places discharged to the sea.

Now the English plains were inhabited by herds of woolly rhinoceros, the mammoth, the Siberian or Saiga antelope, the reindeer, the musk ox and other animals adapted to a cold climate. Several times the glaciers became smaller and the climate warmer, and during these inter-glacial intervals England was invaded by southern animals, including the hippopotamus, hyena and cave lion.

At about the same period a great ice-cap covered Scandinavia, and ice-caps existed in different parts of North America; the last of them still covers nearly the whole of Greenland. While these glacial conditions ruled in the northern lands, southern Europe and some of the desert parts of Africa had a wetter climate than they have to-day.

In the sub-tropical or tropical parts of the Old World, southern Europe, northern Africa or southern Asia, the warm, moist climate favored the development of one of the higher groups of monkeys into an animal of superior intelligence and erect habit, and shortly before the glacial period a tool-using animal became the parent of Man.

Metallic ores derived from the interior of the earth, the Secondary rocks that provide building materials, pottery and fertilizers, the organic products that supply coal, oil and lubricants, have been rendered accessible to Man by the earth movements that have time after time devastated the earth's surface. The processes of destruction and construction, acting through the aeons of geological time, have combined to prepare the world as the home of Man.

LIFE ON EARTH BEFORE MAN

A SHORT STUDY OF THE FOSSIL REMAINS DISCLOSING THE EVOLUTION OF ANIMAL FORMS PRECEDING HUMAN LIFE

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PALAEONTOLOGY, the science dealing with the history of life, depends for its knowledge on the remains of animals and plants that have become buried in the muds and sands which the rivers are continually bringing down to the sea, or else on land in the bottoms of ponds, in sandhills or in the fine dust which, blown about by the wind, has gradually built up the great plains of North and South America and of China and Mongolia.

Once safely buried in such mud and sand, a shell or a bone may be preserved for millions of years in a condition as capable of interpretation by an experienced anatomist as if it had been picked up on the beach at the present day. When the whole skeleton is preserved in place it is possible for a sufficiently experienced palaeontologist to make a restoration of the animal of which it once formed a part. Such restorations may give us an accurate idea of the general form of an extinct animal, but cannot tell us anything about the character of its coat, whether there was or was not a mane or whether the tail was bushy or slender; nor can they tell us anything about the colour of the creature.

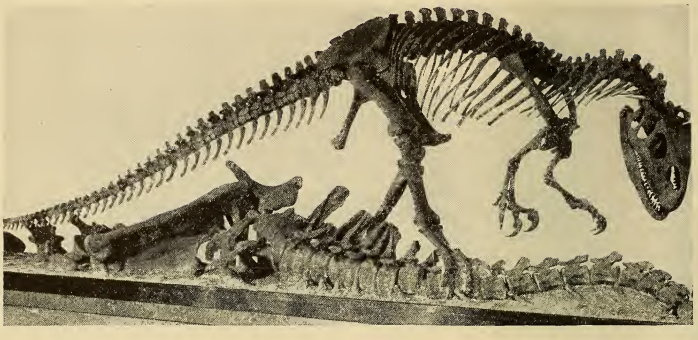
But, despite their shortcomings, these restorations are of great interest, because they do allow us to gain an idea of the mode of life of the animal—whether it lived in trees like a monkey or in the water like a hippopotamus; whether it inhabited bare plains or forests; even whether it lived in herds or in separate families.

The oldest vertebrates known are represented by little fragments of bone from the Ordovician strata of Canyon City, Colorado, U.S.A.; but the first remains which are well enough preserved to enable us to know much about them come from the top of the Silurian rocks of Scotland and Norway.

One of the best-known is Birkenia. These lived in fresh water, perhaps coming down into the wide estuaries and sometimes, though rarely, even into the sea. They are little, fish-like creatures with their heads and bodies covered all over with an armoring of hard scales about the size of small grass seeds. But they lacked the two pairs of special fins which lie on each side of the body of true fishes and enable them to rise and fall in the water as they swim along, and to make small adjustments of their position. Thus their movements must have been clumsy and ill-directed, although their modern descendants, the lampreys, swim well enough to be able to fix themselves on to the salmon and other fish on which they are parasites.

Closely related to these are other fish-like creatures, of which the first found was Cephalaspis; they are of interest because they were the first vertebrates to be cased in armor-plate. They had the head and the front of the body covered with great plates of bone, or some similar material that formed a rigid coating, behind which projected a small flexible tail by means of which they swam. The whole group of which Cephalaspis is typical is known as the Ostracoderms, and they illustrate a type of change which has occurred time after time in the evolution of life.

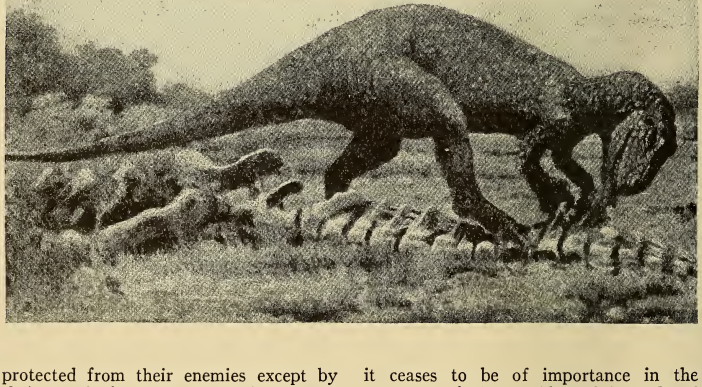
Beginning as little animals of an ordinary fish-like form, they were un-



'DRAGONS . . . THAT TARE EACH OTHER IN THEIR SLIME'

Fanciful writers have sometimes depicted a fierce struggle for survival between the 'first men' and reptilian monsters such as are described and pictured in the following pages, but, in fact, these had passed from off the world's stage millions of years before it resounded to human footsteps. The fearsome aspect of these huge beasts may be gauged from the mounted skeleton of Allosaurus devouring its prey (top), on which the reconstruction (bottom) is based. Agile and light-boned, Allosaurus walked like a kangaroo.

American Museum of Natural History



protected from their enemies except by their speed of movement; as time passed they grew larger and larger and became grovelling forms, living on the bottom and protected by a heavy armoring. But this form of defence always proves unavailing; finally, the group that adopts it ceases to be of importance in the economy of the world, and is replaced by a series of animals of higher and more efficient structure.

The creatures which replaced the Ostracoderms in the fresh waters of the world were real fishes, but fish entirely

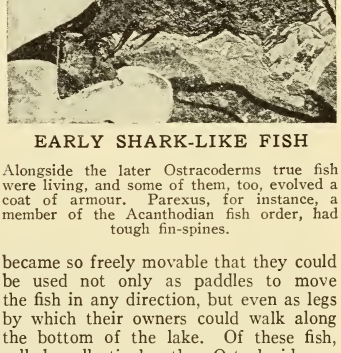
unlike any that are still living. One group of them—Parexus is an example—was remarkable because its members had two rows of little fins, one on each flank, in addition to fins on the back, and each of these fins consisted of a flap of skin supported by tall spines in front. Like the Ostracoderms, they became larger and more heavily armored, until, in the case of a fish which lived at the bottom of the rivers and pools intersecting the coal forests, the biggest fin spines might be nearly two feet and the whole creature perhaps six feet in length.

But living side by side with these spiny fish there was another group of armored fish, in which, as in the Ostracoderms, the front half of the body was protected by great bony plates, the biggest being more than a yard across and two inches thick. Yet even these giants, fifteen feet in length and provided with cutting blades acting like a pair of scissors in their mouths, proved incapable of meeting the competition of more modern fishes, and they in turn completely died out at the end of the Old Red Sandstone times.

The rivers in which the Old Red Sandstone fishes lived were seasonal, running only during the wet season or after rare torrential rains. During the rest of the year they dried up, being reduced first of all to isolated pools and then disappearing altogether, except that their course was marked; perhaps, by green vegetation along the banks. These rivers fed great, shallow lakes inconstant in their extent and depth, like Lake Chad today, and in them were laid down the "flagstones" from which so many specimens of fossil fish have come.

Geographical conditions of this sort seem to have been responsible for that change in the habits of the vertebrates to which we owe our existence. The water in the stagnant pools of rapidly shrinking rivers becomes deprived of oxygen, and a fish is asphyxiated in it just as we are when deprived of the oxygen of the air we breathe. But although the water of these lakes lacked oxygen, there was an unlimited supply in the air, and some of the fish, instead of dying in the water, began to supplement their supply of oxygen by swallowing air. This habit, which is actually seen in some Indian fish living today under similar conditions, led to the formation of a special little pocket in the gullet into which a bubble of air could be passed, for the oxygen to be extracted from it while the useless residue was expired. In this way a lung came into existence.

The fish which developed lungs soon split into two groups, distinguished from each other by the way in which they swam. In the first group, which we will call the fringe-finned fish, the tail was a mere extension of the body, enabling its members to swim by throwing their bodies into waves, while the paired fins



EARLY SHARK-LIKE FISH

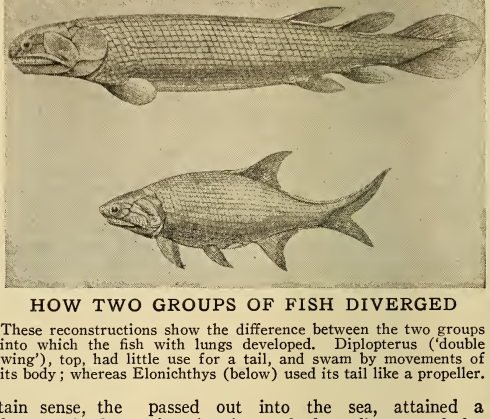
Alongside the later Ostracoderms true fish were living, and some of them, too, evolved a coat of armour. Parexus, for instance, a member of the Acanthodian fish order, had tough fin-spines.

became so freely movable that they could be used not only as paddles to move the fish in any direction, but even as legs by which their owners could walk along the bottom of the lake. Of these fish, called collectively the Osteolepids or Bony-scales, Diplopterus is a good example.

In the other group, the Palaeoniscids, the tail became in effect an appendage to the body which could be flapped from side to side and rotated so that it acted like a screw propeller, or, more accurately, like an oar over the stern of a boat. The members of this group made little use of their lungs, perhaps because they soon migrated into the sea, where there is always as ample a supply of oxygen as in the air itself. From them arose the sturgeons, and also, in later

times, the ancestors of all the familiar bony fish —salmon, herring and turbot alike.

The fringe-finned fish which possessed lungs, however, soon split up into three smaller divisions. One of these took to eating hard food, such as pond-snails and mussels, which had to be crunched before being swallowed. Of this division only three kinds still survive, one in the rivers of Brazil and Paraguay, another in tropical Africa, and the third, Ceratodus, inhabiting two small rivers in Queensland.

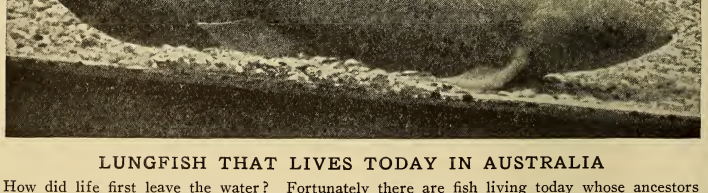


HOW TWO GROUPS OF FISH DIVERGED

These reconstructions show the difference between the two groups into which the fish with lungs developed. Diplopterus ('double wing'), top, had little use for a tail, and swam by movements of its body; whereas Elonichthys (below) used its tail like a propeller.

Ceratodus is, in a certain sense, the oldest of all living vertebrate animals; it differs exceedingly little from its ancestor which lived in the coal forest pools many millions of years ago. The other two lungfishes still live, as did their earliest ancestors, in streams which are liable to dry up, and, like them, they use their lungs to enable them to breathe in the foulest water.

The second division of the fringe-finned fish remained in fresh water for a long period, but eventually its members passed out into the sea, attained a gigantic size and then disappeared for ever. It is, nevertheless, of very great scientific importance, because it shows us what the structure of the third division of fringe-finned fishes must have been. Of the members of this division we have no fossil remains, but we know that it must have existed, and can, indeed, infer what its characters were from those of its descendants. These descendants were the earliest amphibia, the first group of vertebrates which for part of



LUNGFISH THAT LIVES TODAY IN AUSTRALIA

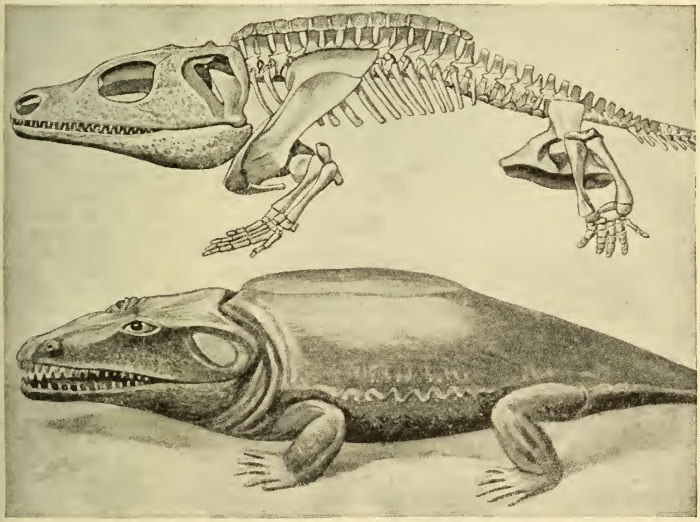
How did life first leave the water? Fortunately there are fish living today whose ancestors of the coal forests took the first step and then progressed no further, thus letting us into the secret. One of these is the Ceratodus ('horn-tooth'), or Barramunda, of Queensland, which extracts oxygen from the water with gills, like other fish, but can also rise to the surface and breathe with a lung.

Photo, 'The Times'

their life depended entirely on air-breathing. For seventy years the oldest amphibian remains preserved in museums came from the ironstone mines and oil-shale works that lie a few miles to the east of Edinburgh. Within the past few years a number of skulls of even earlier and more primitive amphibians have been found in the Upper Devonian rocks of Greenland.

Most of these early amphibia were large, from a yard to twelve feet in length. Their skin was generally unarmored, and probably wet and slimy like that of a frog; but in all of them the belly was covered with a shield of bony scales exactly like those of a fish, and, indeed, directly inherited from their fish ancestors. They spent most of their time swimming by means of a long, flat tail in the ponds and slow rivers of the low-lying swamps, covered with dense forest, which formed the coal seams. But instead of the freely movable paired fins of their fish allies, they had very short, feeble legs, with elbow and knee joints, with flexible ankles and wrists and with five fingers and toes. It is probable that they used these inadequate limbs for crawling out of the water, either to escape the giant fish that may have preyed on them or to pass from a pool which was drying up to another more habitable.

Our knowledge of the animals of past times is incomplete, not only because the bones we find are usually imperfect, but also because animals are not indifferent to their surroundings. At the present day, for example, the wild pigs and ordinary monkeys are only found in woods and forests, while many antelopes and wild asses are inhabitants of open plains. Now our knowledge of the



ONE OF THE FIRST INHABITANTS OF DRY LAND

Loxomma, though lung-breathing and provided with limbs, still spent its life, when possible, in the water. Not so Cacops aspidophorus ('grim-faced shield-bearer'), seen here in skeleton and reconstruction; for the drier climate of Permian times forced many of the Carboniferous amphibians on to the land. Yet they were still amphibians, and, like the newts and toads today, had to re-enter the water to lay their eggs, which hatched into creatures of the tadpole type depending entirely on gills for their first life-phase.

land animals of Carboniferous times is confined to those of forested swamps; we know nothing of the fauna and but little of the flora of the dry uplands.

In the immediately succeeding period, the Permian, however, we have both upland and swamp creatures abundantly preserved and know an amount about them which is astonishing when we remember that they lived many millions of years ago. The swamp animals of the Permian age are merely the little altered descendants of those of the coal forests, but those of the dry lands have changed their habits and structure, some of them having made the second great step necessary for the colonization of the land.

In North Texas there is a series of red muds which we know to have been laid down in a desert lying at sea level and intersected by the deltas of numerous small rivers. In this desert there lived many animals, thousands of whose bones have been collected and placed in Museums. Many of them belong to amphibians, the direct descendants of some of the Carboniferous creatures which we have described, but instead of living mainly in water, as did their ancestors, these animals—Cacops, for instance, and Eryops—had become quite terrestrial, living habitually on dry land and catching their prey there, and went back to water only to lay their eggs as a frog does. Their spawn hatched into little newt-like creatures, living entirely in the water for the first part of their lives just like tadpoles. During this aquatic phase of existence they breathed by gills, like fishes, and only later, when about one quarter full-grown, did they leave the water, depend entirely on their lungs and take on a completely terrestrial adult life.

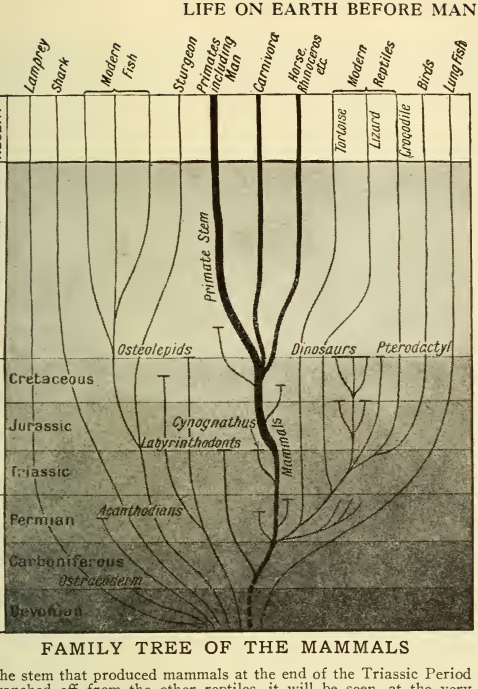
The subsequent history of these forms is interesting. Their dependence on water, either as a breeding place or merely to keep their soft skins moist, rendered them unable to compete with the dry-skinned reptiles, which, even at the beginning of Permian times, had become very abundant in the dry lands. In order to put off as long as possible the evil day when this competition should become inevitable, they gradually extended the length of their larval life in water at the expense of that part of their existence which they passed on land. Finally, they became completely aquatic, in some cases apparently retaining their gills throughout life and becoming incapable of any progression on land.

These creatures are amongst the most grotesque that ever lived; one of the largest of them has a head nearly a yard in length and twenty inches wide, but only about ten inches high. There was no neck, the head passing at once into an extraordinarily flat body, which in turn tapered rapidly to a short narrow tail. The legs were exceedingly short, projecting from the sides of the body, and clearly fit only to move the animal very slowly over the bottom of the lake in which it lived. It was probably fish-eating, catching its prey by waiting motionless on the bottom and suddenly opening its gigantic mouth—which it must have done by raising its head while the lower jaw rested on the bottom.

Some of these forms, however, before they had become flattened, followed the bony fishes down the rivers into the sea; their remains are found in marine deposits of Triassic age in Spitsbergen.

In certain rocks, laid down towards the end of the Coal Measure period in Czechoslovakia and in North America, there have been found the bones of animals which we believe to have been reptiles, the first group of vertebrates to become so completely terrestrial as to be able to carry out the whole of their development on land. They did so, in effect, by wrapping up their spawn, together with a supply of water made into a jelly with albumen, in an envelope which was watertight although it allowed the passage of air. This egg, almost exactly like that of a hen, was laid most probably in a hole in the ground, and hatched by the heat of the sun, like that of a tortoise. As this requires a warm summer the reptiles are and always have been restricted to the warmer parts of the world.

But even with this limitation an animal which need not return to ponds and streams to lay its eggs has open to it a vast field denied to the amphibia, and is, furthermore, much less exposed to damage from drought. We find, in fact, that the reptiles very soon colonized the



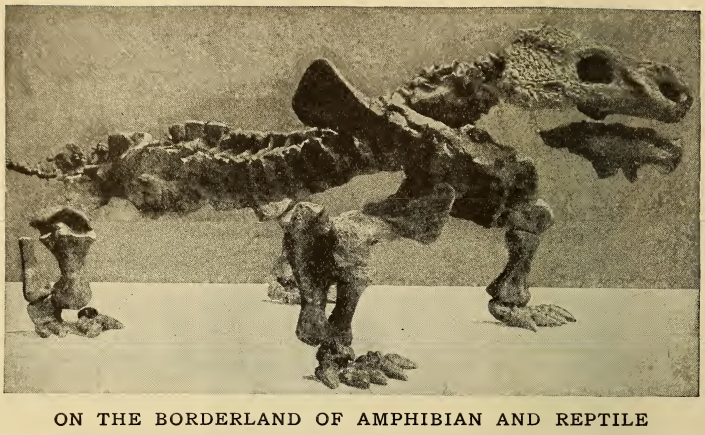
FAMILY TREE OF THE MAMMALS

The stem that produced mammals at the end of the Triassic Period branched off from the other reptiles, it will be seen, at the very start of reptilian existence, namely the beginning of the Permian. This chart also illustrates the dangers of evolution; primitive forms stand the greatest chance of survival.

deserts as well as all other parts of the world, and through the accidents of fossilization the reptiles best known to us are those which, in Permian and Triassic times, inhabited arid regions.

The oldest great assemblage of such forms from the lowest Permian of North America and Europe includes no very large animals, the largest, Dimetrodon or Edaphosaurus, being only some six feet in length. Though they can be divided into two main and many subsidiary groups by anatomical peculiarities, they are all much alike in many fundamental characters.

The most primitive group, the Cotylosauria, is scarcely to be distinguished from the contemporary terrestrial amphibia; indeed, it most closely resembles the Carboniferous amphibia from which they both sprang. Like them, it had the head covered all over with a shield of bone, perforated only by the nostrils, the eyes and a gap on the top of the head for a third eye, whose remnant persists in ourselves as that pineal body which the old anatomists, as they could find no other use for it, regarded as the seat of the soul. In the other main group, the mammal-like reptiles, the bony shield covering the head is cut into by a pair of openings so placed as to give the masticatory muscles, by which the animals moved their jaws, room for expansion. All these reptiles were low-built, with short but powerful legs projecting out sideways so that the hands and feet could not be placed below the body. These animals are of the greatest interest because they include the ancestors of the mammals; indeed; we can trace in the Permian and Triassic rocks of South Africa a continuous change in the structure of their descendants which results in the end in the development of creatures which are very nearly mammals. The changes which bring about this result are very varied, and one of the most important of them cannot from its very nature be seen in fossil specimens. The reptiles, like all lower animals, have no constant body temperature; they follow that of their surroundings, being cold during the nights and almost too hot to touch when resting under a tropical sun. In mammals the body temperature is raised and maintained at a constant level by a mechanism whose derangement, as we know from our own experience, leads



ON THE BORDERLAND OF AMPHIBIAN AND REPTILE

Early reptiles, unlike the later dinosaurs, closely resembled in build the amphibians from which they sprang—they were broad, massive and squat, with short legs jutting out sideways that could only have produced a waddle. Pareiasaurus ('cheekpiece-lizard'), a creature some eight feet long, but of enormous bulk and weight, was probably vegetarian in diet.

From the skeleton in the British Museum, Natural History

to serious results. An important part of the arrangement is the development of a furry coat to act as an insulator, like our own artificial clothing, hindering the loss of heat and making the maintenance of a high temperature less expensive in food than it would otherwise be.

This steady body temperature allows an animal to be equally active in all climates, and when associated, as it always is, with a much improved heart, permits of a continuous activity impossible to a cold-blooded reptile. Furthermore, the high body temperature enables the eggs to be incubated and the animal to maintain its race in a cold climate.

This increased power of movement would have been of little use to the earliest mammals had not their reptilian ancestors undergone a slow change in structure that made the last of them, like Cynognathus, far superior as machines to the primitive forms which we have just described. These creatures are called Theriodonts, because their teeth approximate so closely to those of the mammals proper. We can trace a gradual elongation of limb and a pulling in towards the body first of the hands and feet and then of the elbows and knees, resulting in a raising of the body from the ground and a lengthening of the stride which all conduced to more rapid movement.

In association with these improvements in wind and limb the ancestors of the mammals exhibit improvements in their brain, that part of it which is concerned with the co-ordination of movements and the preservation of balance being greatly enlarged. At the same time, the sense of hearing, non-existent in most fishes and very rudimentary in the amphibia, began to take on the power of distinguishing between different musical notes, gained greater acuity and became valuable as giving warning of the approach of enemies or, in the case of carnivores, of the proximity of food.

Thus by the end of Triassic time mammals had come into existence. Despite their higher organization they did not for a very long time dominate the world as they do now. Throughout the whole of Mesozoic time they remained small, none of them as big as a cat, living perhaps mainly in trees, while the land, the sea and the air were alike possessed by reptiles. These were the descendants

of creatures which, living alongside the ancestors of the mammals, were in no way closely related to them, and became fitted for the most varied types of life in quite different ways.

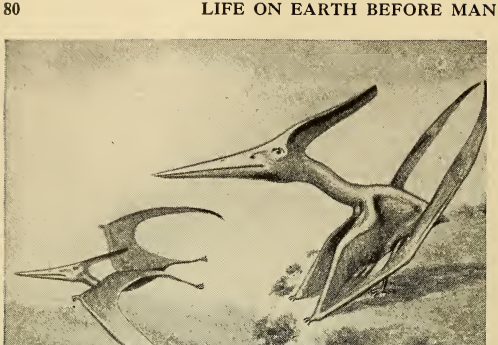
The most remarkable are the dinosaurs, a group which included the largest land animals that have ever lived. First, there were the giant herbivores, such as Brontosaurus, reaching a length of some eighty feet with a weight of thirty-five tons, which spent their lives wading about in the estuaries of rivers and in the sea along the coast. They scooped up seaweed with their inadequate teeth and were capable of reaching up to a height of about thirty feet, so that they could breathe even when walking on the bottom in water of that depth.

Secondly, on the land, even in the arid plains which then existed in Mongolia, there were other herbivorous forms, some, like Trachodon, resembling giant kangaroos in shape and walking on their hind legs alone, while others walked on all four legs and carried a heavy armor of bony plates along their backs, like Stegosaurus. Others, free from body armor, had horns on their heads and a great bony frill projecting over their necks.

RESTORING LIZARDS THAT LIVED MILLIONS OF YEARS AGO

Reptiles had not really mastered their environment before the Secondary Era, during which the dinosaurs were lords of creation. Compare the obviously agile and highly specialized creature above (Saurolophus—'crested lizard') with clumsy Pareiasaurus in page 78. Below, Corythosaurus ('helmet-lizard'), a closely allied form, is being exhumed from its Cretaceous bed; often it takes months of patient labor before the bones of such monsters can be freed from the surrounding rock and mounted.

Photo by Barnum Brown, courtesy of American Museum of Natural History



HOW PTERANODON 'TOOK OFF'

Pterodactyls, though perfectly adapted for flight, were not birds, but a kind of dinosaur that had grown a leathery membrane between foreleg and hindleg. But to achieve lightness they acquired many avian features; their bones, for instance, were hollow tubes made strong with internal struts.

Reconstruction from material supplied by Prof. D. M. S. Watson

The chief enemies of these creatures were the third type, the carnivorous dinosaurs, all kangaroo-shaped, and of all sizes from that of a hen to a monster called Tyrannosaurus, standing some fifteen feet high and more than thirty feet long.

From the same stock as the dinosaurs arose the flying reptiles, the pterodactyls, which became so perfectly fitted for life in the air that many of them, such as Pteranodon, lived like the seagulls and albatrosses, by catching fish, even on the high seas far from land.

The seas themselves were invaded by two great groups of reptiles, one, the ichthyosaurs, whale-shaped animals capable of swimming rapidly, lived on cuttlefish and even smaller individuals of their own kind. These animals had got over one of the chief difficulties which a marine life presents to reptiles: instead of coming to land to lay eggs, they brought forth living young capable of fending for themselves. Most of the members of the other group, the plesiosaurs, were remarkable for their immensely long necks and small heads. They seem to have caught fish by sudden turns and sharp snaps of their widely-opening mouths, and not by sheer speed like the ichthyosaurs.

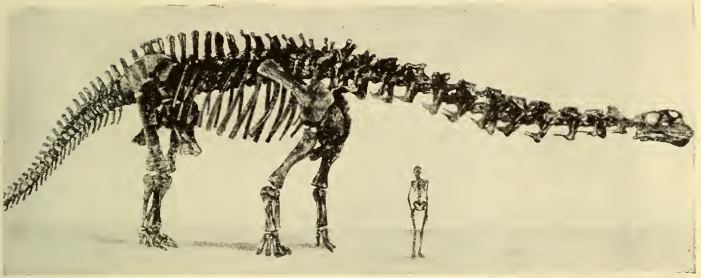
The birds arose in Jurassic times from animals closely related to the dinosaurs. Their flight depends on feathers—wonderfully modified scales—which serve to give sufficient wing-surface for support in the air, with a minimum of weight. Archaeopteryx, known from two fossils, is the earliest link in the sequence yet discovered.

All the great reptiles died out at about the same time; and after their disappearance the land and sea remained unoccupied by any large vertebrates.

At the beginning of the Tertiary period there appeared in France and in North America a group of small mammals, the largest no bigger than a sheep—forerunners of the great mammalian fauna which ever since has populated land and sea and even passed on to live in the air.

The lands on which these mammals underwent their evolution had a geography very different from that familiar today, and the distribution of land and sea has only slowly become that which we know. Nevertheless, there are certain parts of the world which are stable, regions that have been land throughout the Tertiary period and even from times long before that. These regions—eastern Canada, Mongolia, Central and South Africa, Brazil and Western Australia—have always formed parts of continents, varying in size from age to age, but always serving as evolutionary centers wherein mammals underwent their evolution and familiar animals came gradually into existence.

Australia was the evolutionary center of those animals which still occupy it and which are so far peculiar to that continent that none of them has been able to migrate farther than New Guinea. The kangaroos, the wombats, the Tasmanian



The dinosaurs of Mesozoic times were the fine flower of reptilian creation, and they had a great variety of form. Brontosaurus ('thunder-lizard') belonged to those called Sauropoda, or lizard-footed, which were the biggest quadrupeds known, some being 100 feet long; the human skeleton gives the scale.

BRONTOSAURUS, ONE OF THE VASTEST OF THE QUADRUPEDS

Its teeth show Brontosaurus to have been a vegetable feeder—indeed, it was obviously too unwieldy for a carnivorous life. It may sometimes have walked dry land, but probably spent most of its time, like the nearer one in this reconstruction, with its long neck projecting from shallow estuaries.

American Museum of Natural History

devil and wolf are purely Australian, playing no part in the history of the rest of the world because Australia has been sundered therefrom by wide straits throughout Tertiary time. But the original pouched mammals which settled in Australia were only members of a group which at that time was spread over the whole world, and has left as its descendants the opposums of America.

South America is a continent whose early history resembles that of Australia. It also was a great land mass, separated by a wide strait from North America, on which several groups of unfamiliar mammals, living in isolation from those of the more vigorous North, evolved into bizarre creatures now represented only by the sloths, anteaters and armadillos. But while Australia has retained its isolation until today, South and North America became connected by the isthmus of Panama, across which northern mammals—tapirs, cats, dogs, deer, horses—passed south, and the now extinct giant ground-sloths and the armadillos trekked north to the United States.

From the investigations of the past century we have become very well acquainted with the history of the animals that have inhabited western Europe and the western half of the United States of America. Much more recently we have extended our knowledge of India and discovered the importance of Africa. Lastly, since 1920, we have learnt the history of Mongolia with remarkable completeness. The history of the mammals which are of special importance to Man is thus well known, and an account of them not only serves to illustrate by parallels Man's own story, but also sets the stage on to which he came.

BIRD THAT WAS HALF A LIZARD

Even modern birds are lizard-like in many ways, and we can have no further doubt of their origin from reptiles when we find fossil creatures with teeth as well as beaks, and fingers as well as feathers on their wings. Archaeopteryx ('ancient-wing') was discovered in Jurassic strata of Bavaria.

From the original in the Berlin Museum

Now, the time during which Tertiary rocks were being laid down was an immensely long one: some millions of years separate us from its beginning. It is, therefore, necessary to split it up into periods following each other in succession, which give us a time scale, not in years, but exactly analogous to the division of Egyptian or Chinese history into dynasties.

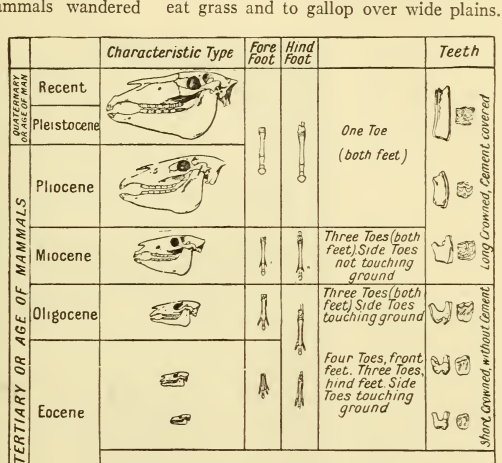
Of these periods the first is the Eocene, a name that means Dawn of Recent (Life). This is succeeded in turn by the Oligocene, Miocene, Pliocene, Pleistocene and Recent periods, only the last two of

which yield undoubted remains of Man, although some of his ancestors—men at least by courtesy—lived in Pliocene times.

In early Eocene times the great North Asiatic center of evolution was connected with Europe and with North America by land, across which mammals wandered so freely that we find the same creatures all over this vast northern continent. Amongst these were our own ancestors, and those of all the Old World monkeys and anthropoid apes, in the form of little Tarsioids, very small, monkey-like creatures with large eyes looking directly forward, with big brains and a small face. They and all their relatives were tree-living, eating leaves and fruits and probably also such insects as they could catch.

Galloping over the plains on which these trees grew was the oldest known ancestor of the horse, called Eohippus, no larger than a fox-terrier and very like one in proportions. With them were numbers of little creatures that included the ancestors of the even-toed animals, the pigs, sheep, oxen and deer. Preying on them were carnivorous animals, amongst which we find the ancestors of the dogs and mongooses, though none which we can associate with the cats.

Towards the middle of Eocene times the land lying to the east of the Ural mountains sank and became a strait connecting the Arctic sea with the great Mediterranean, which in those days stretched eastward to cover the region now occupied by the Himalayas. As a result, Europe became disconnected from the joint continent of North Asia and America, and on it many animals evolved, few of which, however, have any descendants still living. Thus isolated, the horse ancestors, for example, branched out into strange creatures, the Palaeotheres, with little trunks like tapirs, and did not go on, as their eastern relatives did, to become fitted to eat grass and to gallop over wide plains.



HOW THE HORSE EVOLVED

Fossil skulls, toes and teeth show how the horse has changed through millions of years, from tiny three-toed Eohippus (reconstructed on page 84) to the sizable hoofed creature that serves Mankind today.

Courtesy of American Museum of Natural History

Almost the only animals of modern interest which originated in Europe at this time are the pigs and antelopes.

It was probably on the plains of central Asia that the horses pursued a gradual but steady evolution, side by side with deer ancestors, whilst in North America the camels pursued a parallel course of increase in size. The oldest Tertiary mammals which we know from Africa belong to this period and give evidence that the continent was and had long been almost completely isolated.

By Oligocene times dogs and cats are recognizable in both Europe and North America, but most of them belonged to groups, such as the sabre-toothed cats, which are no longer living. Towards the end of the same period Africa became connected with peninsular India, and mastodons invaded Asia, there to develop into those true elephants that lived alongside early Man in England as in so many other parts of the world.

At a later period, the Miocene, Europe became connected directly with Mongolia and with India. It then received a peculiar horse, adapted to browsing and to life in forests, true deer with small, simple antlers, and also the first mastodon, accompanied by the first anthropoid apes, closely allied to the ancestors of Man as well as to those of the chimpanzee and the gorilla. Meanwhile, a gradual evolution brought into being many diverse forms of antelope, probably in India; it was certainly in India that some of them passed on to become in course of time the first of the oxen.

DIMINUTIVE DAWN HORSE

The horse is one of the few mammals whose ancestry can be traced through a series of fossils stretching back to the Eocene. Its earliest form, Dawn-horse or Eohippus, illustrated in this model, was no bigger than a modern horse's skull (shown above it on the same scale) and looked rather like a fox-terrier.

Courtesy of American Museum of Natural History

Miocene times brought to America a few animals from southern Asia; most important were the mastodons, which, being great travellers, ranged onward and, finally, when the Isthmus of Panama was formed in Pliocene times, passed downward into South America.

The beginning of Pliocene time saw the spread of a marvellous mammalian fauna over the wide grassy plains which extended from the extreme west of Europe across south Russia to China. There were several kinds of three-toed horses, five or six different rhinoceroses, some with no horns, the others with two; there was an extraordinary animal (Chalicotherium, much like the better-known Moropus) with a horse-like head but with immensely long forelegs, short hindlegs, and toes, all ending in huge claws, which enabled the animal to dig up roots for food; there were giraffes and okapis, and with them closely allied forms, but of giant size and rather different in appearance. Antelopes in great variety grazed over the plains, some with horns like gazelles, others with long, greatly curved horns like the sable antelope of Africa, and others with spirally twisted horns. There were pigs, including a giant form with a skull nearly two feet in length. Walking amongst them were several different sorts of mastodons, elephants with four tusks, two in the upper and two in the lower jaw.

Preying on these creatures were wolves of many sorts; hyenas and some less heavily built but similar forms; sabre-toothed cats; and a bear of a curious type. In the trees and rocks lived a small monkey, perhaps the ancestor of the baboons.

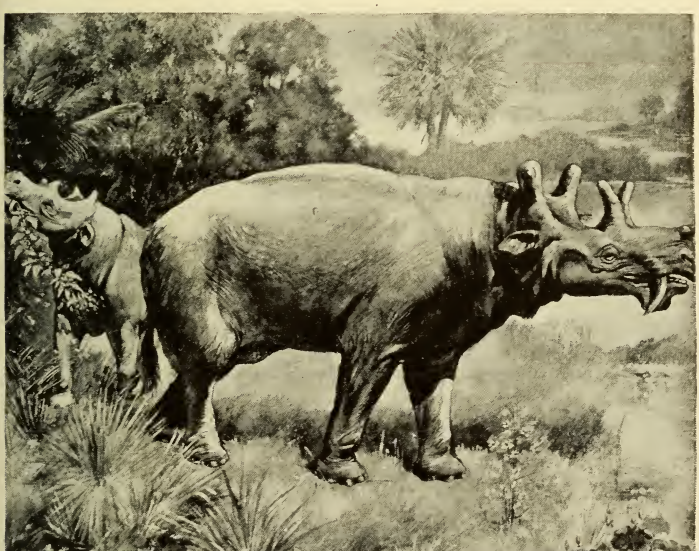
This great fauna is found with minor modifications from Spain to China; to

the north of it, in the forested region of Germany, there lived a somewhat different set of mammals, among which were tapirs and a huge elephant-like creature, Dinotherium, with down-turned tusks in its lower jaw only, while the antelopes were replaced by deer. To the south, in India, was a variant set, including one-horned rhinoceroses and great herds of hippopotami.

After a short period this great fauna vanished from Europe and North Asia, passing down to colonize Africa, and in its place there came in a new group of animals. Of these the most interesting are the true one-toed horses, the true elephants, the hippopotami and the oxen, but with them were numerous deer.

This Upper Pliocene fauna is found in what is known as the forest bed on the Norfolk coast and lived in England when the climate was a little warmer than it is now. From those times to the present day the English climate has undergone a series of changes; periodically it became so cold that the mountains of Wales, the Lake District and Scotland gave rise to glaciers big enough to flow together and form a thick ice sheet covering not only the hills where it arose, but the lower-lying land of Lancashire, Cheshire and Shropshire, filling much of the Irish Sea and meeting the Irish glaciers. To the east, the ice avoided the Pennines and the moors of Cleveland, but streamed out over Northumberland until it met the much greater river of ice coming from Norway and was forced southward to impinge on the East Anglian coast.

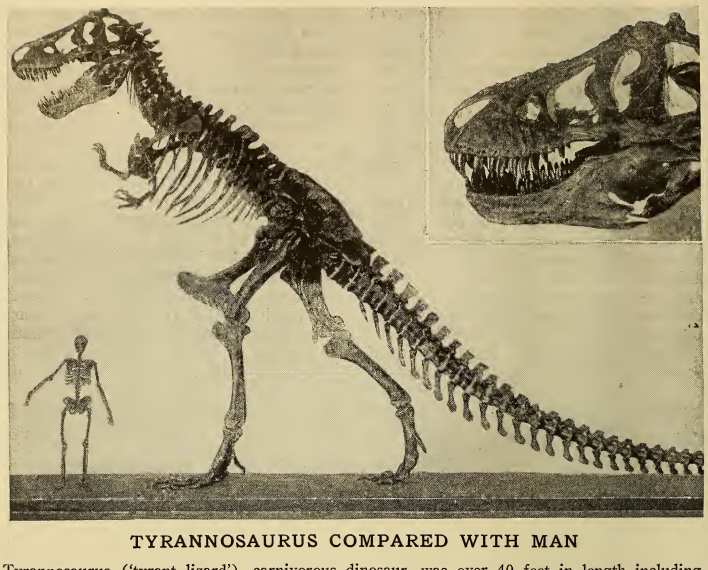
But this great ice sheet, like that of



BULKY BUT BRAINLESS: AN EXTINCT MAMMALIAN MONSTER

The little mammals of the early Eocene mostly progressed in complexity and brain-power till they became the mammals of today; but one group grew only in bulk without any increase in the size of the brain, and we are not surprised to learn that it is now quite extinct. The Dinoceras ('terrible-horn') was a member of this group; it lived in North America. Though a vegetable feeder, it obviously deserved its name.

Reconstruction by C. R. Knight, American Museum of Natural History



TYRANNOSAURUS COMPARED WITH MAN

Tyrannosaurus ('tyrant lizard'), carnivorous dinosaur, was over 40 feet in length including the tail. Its jaws were furnished with terrible sabre-like teeth, as shown by the inset head (above); for this gigantic maw a man (skeleton on same scale), had he unluckily lived in the Mesozoic Era, would just have made a mouthful.

American Museum of Natural History

Greenland today, was not permanent; several times it crept forward and then withdrew, because its end melted faster than it was replaced, so that we have an alternation of glacial and interglacial times, cold and warm respectively. It was under these conditions that the first human inhabitants of Britain of whom we have knowledge hunted animals for food and for the materials of their clothing and tools.

The first onset of the cold climate is marked by the incoming of the mammoth, a large elephant with very big, spirally-coiled tusks. This animal is known to us not only by complete skeletons, but also by the magnificent sketches and statuettes made on the walls of caves and on mammoth ivory by the Palaeolithic hunters. These drawings show the animal covered with long fur hanging down below the body.

Fortunately we are able to confirm this somewhat unusual condition from the actual skin and hair of mammoths preserved in the frozen soils of North Siberia. They were covered with a thick coat of reddish hair, through which projected much longer and thicker black hair.

The mammoth was always accompanied by the woolly rhinoceros, an animal closely allied to the white rhinoceros of Africa and, like it, provided with two horns. With these two animals are found the remains of bison and of a gigantic ox, the aurochs, with long, forwardly directed horns. Red deer and the extinct Irish deer lived in the forests, horses on the open country. There were many bears, also hyenas and lions.

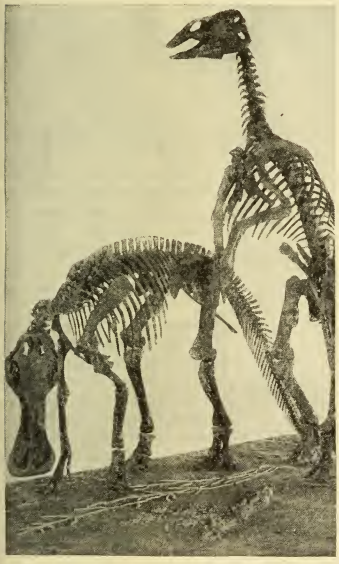
With the return of warmer conditions the mammoth and woolly rhinoceros left the country, no doubt travelling to the north after the retreating glaciers, and

their place was taken by the straight-tusked elephant. With it are found the bones of a two-horned rhinoceros, differing from that which departed with the mammoth, and these two were accompanied by the hippopotamus. It was during this warm period that river-drift Man lived in western Europe.

A return of glacial conditions brought about a southerly migration of the straight-tusked elephant and its companions and the re-colonization of England by the cold-loving mammoth. The next and last cold period, which may have ended only some 10,000-12,000 years ago, brought great hordes of horses and of reindeer. Since this time the climate has, with many fluctuations, become milder, and the once splendid fauna has become thinned by the destruction of one animal after another, either for use as food or because it was dangerous to Man or to domestic animals.

In this general sketch of the evolution and migrations of the vertebrates it has been impossible to follow out the history of any one animal in detail. But an understanding of the mode of origin of Man is made much easier by comparison with the better-known history of some other animal. Although that of many mammals is very completely known, we will take as an example the evolution of the elephant, which is especially interesting because that animal is so unlike all others.

The first elephant ancestor, called Moeritherium, is found in the Upper Eocene of the Fayum in Egypt. It was an animal about three feet high with



UNCOUTH CREATURES OF THE PRIMEVAL MARSH-LANDS

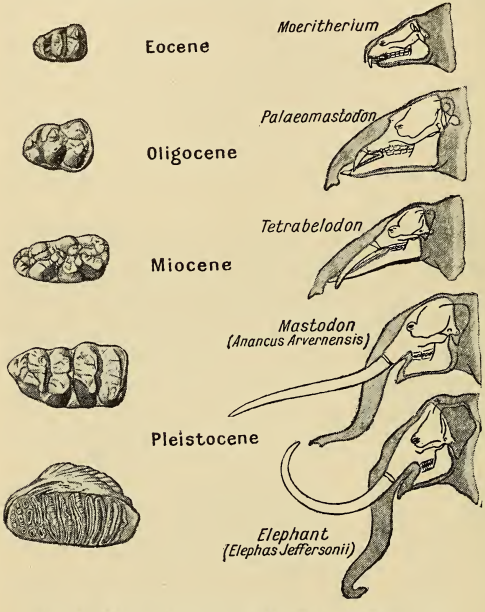
Some of the herbivorous dinosaurs walked on two feet like the carnivores, only using the fore-feet to support the body when feeding; they are known as the bird-footed class. (Ornithopoda), owing to the ostrich-like structure of their hindlegs. Trachodon ('rugged-tooth'), here shown in skeletal and reconstructed form, lived in Cretaceous times and was some 34 feet long.

American Museum of Natural History

comparatively slender legs, much more bent at the elbow and knee than those of the true elephants. Its neck and head were long and its eyes were very far forward. There was no trunk, but the end of the snout was flexible, perhaps used like that of a pig for rooting in the ground.

The teeth show that it was pig-like in habits. The cheek teeth have small square or triangular crowns, very low and covered with little hummocks joined together so as to make two transverse ridges. The front teeth are peculiar, the eye teeth being very small, while one pair of both upper and lower front teeth (incisors) are thickened and enlarged for the grubbing up of roots and of bulbs.

By Oligocene times the descendants of the Moeritherium had grown much larger and reached a stage called Palaeomastodon, an animal about four or five feet high that had already got tall straight legs like an elephant, but still retained a long neck. In order to enable it to dig in the ground the head had to be lengthened, relatively to the body. This was brought about by an elongation of the lower jaw, which carried the large and now shovel-shaped lower incisors forward, well in front of the upper incisors, that had grown into very short, downwardly directed tusks.



FROM MOERITHERIUM TO ELEPHANT

Like the horse, the elephant has a well-attested pedigree. As Moeritherium grew in size, its chin lengthened to enable it to reach the ground, while the fleshy part of the upper jaw kept pace; later the chin shortened again, allowing the trunk to hang down. There were parallel changes in the teeth.

After Lull, 'Animal Evolution'

In order that the animal might be able to crop plants, the long upper lip, which now projected in front of the skull and was unsupported by bone, had a hard pad, like that of a cow's upper jaw, on its lower surface, and the end of the nose was becoming more flexible, perhaps as mobile as the little trunk of a tapir. In order to grind up the amount of food that so large an animal required, the cheek teeth had become bigger, by an increase in the ridges crossing their crown.

In the Lower and Middle Miocene the animal, now called Tetrabelodon, had become much taller. This increase in height made it difficult to reach the ground with the front teeth, a difficulty which in most similar cases was overcome by lengthening the neck. The elephants, however, since they dug with their lower jaw, could not use this method because of mechanical difficulties, and so they were again compelled to lengthen the lower jaw and tusks. This change resulted in a still further lengthen-

ing and an increased flexibility of the front part of the face, including the nose and upper lip. The upper tusks grew yet larger but were still down-turned.

By the next stage, which is reached in Lower Pliocene times, the animal had grown still taller, and its neck was even shorter. It had now become impracticable to reach the ground with the lower front teeth—it would have required a jaw some eight feet long—and so the mastodons had to adopt some other method of feeding. Probably even in the preceding stage they had been accustomed to pluck leaves with their flexible muzzles, and now they came to rely entirely on that organ. But the use of the trunk must have been very much hindered by a long lower jaw stretching out below it, and we find in consequence that the chin very rapidly shortened, the tusks getting smaller at the same time.

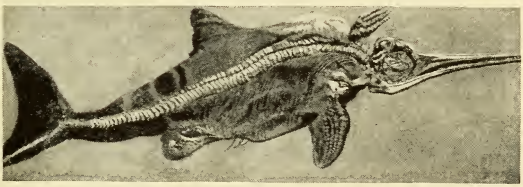
This retreat of the jaw left the roof of the mouth exposed; the belt of skin running down the under side of an elephant's trunk, and differing a little in its nature from the rest, is really the roof of the mouth, which in early forms was actually opposed by the tongue and the cavity of the lower jaw.

When the chin had retreated in this way the unsupported trunk naturally fell down vertically, and thus gained a new freedom and an increased power of use as a feeding organ. At the same time the cheek teeth became still more complicated by a further increase in the number of ridges which crossed them.

An animal as large as the elephant had now become, required a gigantic amount of vegetable food—had, indeed, to spend a very large proportion of its time in feeding. At the same time the length of its life increased. It, therefore, needed teeth which would rapidly and effectively grind up its food, and at the same time be able to last the animal throughout the whole term of its life.

In the living elephant these two needs are met by multiplying the number of ridges across the cheek teeth and so greatly increasing their height that they become flat plates, which may be some eight inches high. To secure strength these plates are soldered together by a bone-like substance called cement. This arrangement makes each tooth more efficient and more lasting. But in order to add still more to the life of the dentition, and hence to that of the animal, the elephant uses only two cheek teeth in each side of each jaw at the same time. As each tooth is worn out it is replaced by another which grows up from behind. Thus during its lifetime an elephant wears down a little less than a yard of solid tooth. The changes which produced this marvellous set of teeth can all be followed in detail in the elephants from the Pliocene period in India, but they are too lengthy to be described in detail here.

As soon as the chin had been withdrawn and the trunk had become freely movable, the upper tusks began to bend upwards so that they could be used as crowbars for uprooting trees and, in conjunction with the trunk, for breaking off boughs. Thus gradually the living elephants came into existence, owing their many peculiarities to a constant and successful attempt to cope with the problems presented by their steadily increasing size.



REPTILE AT HOME IN THE SEA

The lizard-finned and fish-finned reptiles took to the seas quite early in Mesozoic times and became as well-adapted to their environment as the mammalian porpoises. The skeleton of Ichthyosaurus ('fish-lizard') shows how the feet in course of ages became paddles.

Courtesy of Prof. J. W. Gregory

THE EVOLUTION OF MAN

HOW ANTHROPOLOGY AND ANATOMY COMBINE TO PROVE MAN'S SLOW ASCENT FROM LOWER FORMS OF LIFE

SIR ARTHUR KEITH, M.D., D.Sc., F.R.S.

Fullerian Professor of Physiology, Royal Institution, 1917-1923; Author of 'The Antiquity of Man,' 'New Discoveries Relating to the Antiquity of Man,' 'Concerning Man's Origin'

WHEN we speak of the evolution of Man we really mean his history—the history of how, when and where he came by the characters of his body, the faculties of his mind, his upright gait and his powers of speech. Clearly, if we are to write of these early events we must carry our search into a period which lies far beyond the limits of written history; we have to tell about things which happened in the world when there was no brain fit to understand them and no hand capable of recording them.

How, then, is it possible for us to know what happened so long ago, and to write a history of events which took place thousands of years before there was any intelligent hand in the world to record them? It has become possible to supply these long-lost chapters of Man's ascent because we have learned, in recent years, how history can be written in a new way.

Rather more than a century ago a small band of Danish antiquaries, out of pure curiosity, began to dig into the ancient tombs which are scattered over the face of their country, and to collect the objects found in them—weapons, ornaments, vessels and often human remains. They placed all that they found in the Museum of Northern Antiquities, Copenhagen, which is now included in the National Museum of that city; and by about 1830, when their collection had become extensive, the leader of the antiquarian band, C. J. Thomsen, observed that it was possible to divide prehistoric graves into three kinds: there were those which contained no metallic objects—only implements and weapons of stone; in another kind the weapons and ornaments were of bronze, while in a third group of graves they were of iron.

To explain the varied contents of these three kinds of graves, Thomsen made the happy guess that they represented burials of successive periods of time, those with bronze being older than those with iron, and those in which the weapons were stone being older than those in which objects of bronze were found.

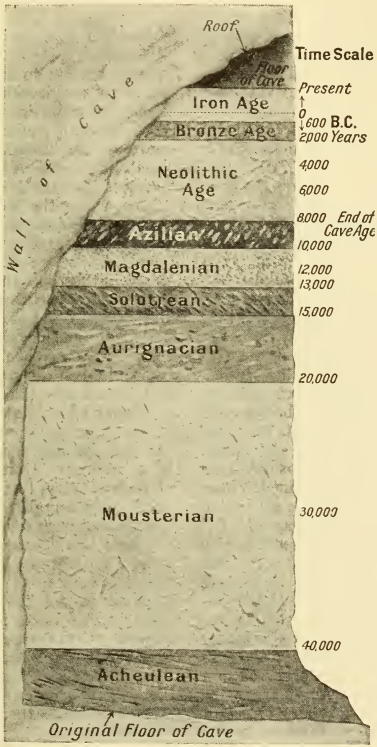
He soon proved that his supposition was right; it was borne out by other kinds of evidence which came to light. When peat-cutters were at work on the moorlands and when, in other places, deep foundations were being dug for new buildings, or when trenches were cut for the laying of drains, there came to light objects which former inhabitants of Denmark had lost or cast away, and the order in which they came to light was always the same—those of iron nearest the surface; deeper still those of bronze; deepest of all those of stone.

The Danish antiquarians began to perceive that the earth itself kept a record of Man's doings; in ancient tombs, in peat bogs, in river banks there were preserved hieroglyphs of Man's past—the materials out of which history could be written. From such evidence Thomsen concluded that three successive ages must be distinguished in the prehistory of Man—a Stone Age, a Bronze Age and then an Iron Age. It was in Denmark, which, in a geological sense, is amongst the youngest of European countries, that Man's early history began to be written in this new way.

The archaeologists of France did more than those of any other country to turn this new way of writing history into a science. In large parts of their country, particularly in the region of the Dordogne, there are many natural limestone caves; it was in the floors of these caves that French archaeologists discovered

their materials for history. Edouard Lartet and his colleagues began to examine them systematically about 1860, and found that many had been used as human habitations or burial-places throughout long ages.

Fortunately for the historian, the cave-dwellers, were not cleanly folk; they never swept their floors; the débris of their feasts, their ashes and disused hearths, their discarded tools and their lost ornaments were trampled underfoot. Dust blew in at the mouth of the cave; chips of rock, or water laden with calcareous salts, dropped from the roof. Thus the floor of the cave gradually rose in height until the cave-dwellers had underfoot ten, fifteen or even thirty feet of various strata, each of which represented a historical record of a long time past. Not infrequently the cave-dwellers also buried their dead in the floor. Exploration had not proceeded far when the French archaeologists perceived that the caves of their country carried the history of Man far beyond the period of the most ancient of Scandinavian tombs. The Iron, Bronze and Stone ages—such as were recognized by Danish antiquarians—were confined to the more superficial strata of the French caves; deep under these the antiquarians came across deposits, layer after layer, in which there were stone implements of an altogether different type from those of Denmark. In the same strata occurred the fossil bones of diverse animals which had been long extinct in France—bones of reindeer, hyena and cave bear.



MAN'S STORY IN THE SOIL

The deposits on the floors of cave-dwellings show the time-sequence of objects discovered. This diagram represents an ideal cave-floor with all possible layers present; the dates (Sir Arthur Keith's) give their *relative* durations.

An Englishman, Lord Avebury, coined happy names for these two kinds of stone implements: the kind known to the Danes he called neoliths (new-stones), and the time in which they were made he named the Neolithic period; the stone implements of the caves he named palaeoliths (old-stones), and the age of their manufacture he called the Palaeolithic period.

Very soon the French archaeologists perceived that the cave period covered a very long space of time, for as they dug they found evidence that there had been changes in the climate, and that it was possible to distinguish one stratum in the cave floor from others by the kind of paleoliths it contained. They found that there was not one Palaeolithic age, but a sequence of them, each

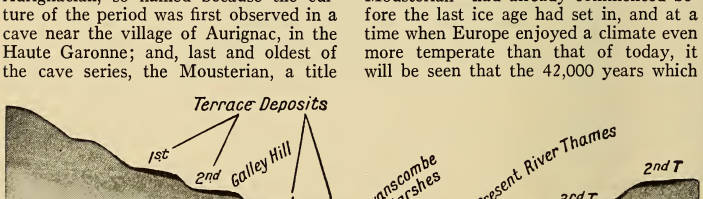
age being distinguished by the style or fashion in which its palaeoliths were worked. Further, on comparing one cave with another, it was found that the sequence of fashions or cultures was always the same. Later, when the archaeologists of Britain, Germany, Italy and Spain came to examine caves, they found that they had, in their own countries, the same Palaeolithic cultures as in France, and that one culture had followed another in the same sequence.

Let us glance for a moment at the point which present-day archeologists have reached in the deciphering of cave history. In the previous page there is a section of an ideal cave—one in which there is no missing stratum. We may pass over the three upper layers, or strata, in which are found records of the Iron, the Bronze and the Neolithic ages, and come to the uppermost, or latest, of the true cave strata; to the chapter of history represented by this stratum archaeologists have given the title Azilian, because the stone implements and ornaments fashioned by the men of the time occur abundantly in a cave near the village of Mas d'Azil, on the upper waters of the Garonne, France. Then come in sequence, as we go farther backwards in time, the chapters (all named after French localities) headed Magdalenian, so named because the culture of the period was first found in the La Madeleine cave, in the Dordogne; Solutrean, from the famous habitat of ancient Man at Solutré, near Mâcon; Aurignacian, so named because the culture of the period was first observed in a cave near the village of Aurignac, in the Haute Garonne; and, last and oldest of the cave series, the Mousterian, a title given because its peculiar flint implements were first known from the cave at Le Moustier, in the Dordogne.

Although at first it was believed that there was a sharp transition from the Palaeolithic period to the Neolithic, it became evident to archaeologists early in the 20th century that this was not so. There are transitional cultures which are now named Mesolithic. Under this designation are included the last of the Palaeolithic—the Azilian, and the opening phases of the Neolithic.

Concerning the sequence in which the chapters of ancient history have to be arranged archaeologists are in no doubt; as we follow the history of Man backwards in Europe the cultures of these ages always occur in the order named. But when we are asked, How long is the period of time covered by each of these six chapters? When did the cave period begin? When did it leave off?—we have to fall back on reasoned guesses.

We do know, however, that the cave period came to an end after the close of the last ice age, and Swedish geologists have been able, from the glacial records of their country, to form a reasoned estimate of when glacial conditions finally disappeared from southern Sweden. They conclude that it was about 12,000 years ago. Thus we may fix the date at which the last chapter of Man's cave history came to an end about 10,000 years ago (8000 B.C.). When we consider that the earliest of the true cave periods—the Mousterian—had already commenced before the last ice age had set in, and at a time when Europe enjoyed a climate even more temperate than that of today, it will be seen that the 42,000 years which

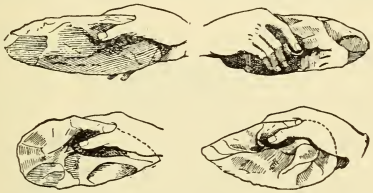


PREHISTORY REVEALED IN THAMES DEPOSITS

Each of the four terraces seen in this diagram of the Thames valley at Galley Hill was at some time part of the river bed, when alluvial matter accumulated on it. Periods of erosion followed those of deposition, and so the present valley was carved out in steps; Pall Mall, Picadilly and Holborn are on successive terraces.

are supposed to have elapsed since the Mousterian period began is not likely to prove an over-estimate.

This, the earliest of the true cave periods, we shall see, is to prove the most important of the series, for it contains the bones and the culture of a type of humanity exceedingly different from, and far more primitive than, any race of Man now living. This race or species—for it was totally different from any living race—is known as Neanderthal Man. Both men and women had curiously shaped skulls, with flattened roofs and great supra-orbital ridges over the eye sockets, but with relatively large brains. They were squat, thick-set people with a waddling gait. They became extinct at the end of the Mousterian age. Thus, by an intelligent use of the spade, the history of cave Man has been traced through and beyond the last of the glacial epochs—to a species quite unlike ourselves. *Homo-neanderthalensis*. The evidence of caves confirms us in the belief that the sole inhabitants of Europe throughout the long period when stone implements were fashioned in the Mousterian manner were men of the Neanderthal type.



HOW CHELLEAN AXES WERE USED

Hand-axes, or 'bouchers,' were believed to have been shaped by Nature until Boucher de Perthes perceived Man's handiwork in their forms; this is his own drawing of how he thought they were used.

Primitive as was this type of Man, yet in his body, brain and ways he was altogether human; to find the morning of Mankind we must resort to an altogether different kind of history—the kind which is written by stream and river. Never a shower of rain falls but some loose object is washed from meadow or ditch into a neighboring stream; every flood which sweeps over a valley bears away the carcasses of drowned beasts and carries them out to the main channel of the river, where they sink; sooner or later some fragments of them become incorporated in the mud and gravel of the river's bed.

A river never runs straight; it meanders from one side of its valley to the other, eating into its bank at one place and filling it up at another. Hence the bed of a river, with treasure trove garnered from all parts of the countryside, does not form a long, narrow strip down the middle of a valley, but a wide sheet which underlies the meadows and fields that cover its floor. In this way every running stream writes history along the floors of valleys.

If a land neither rises nor falls, but maintains a constant relation to the level of the sea, then its streams, as they meander along their valleys, plough and replough their old beds. But let us suppose the land begins to rise; then its rivers run more swiftly and in time deepen their valleys, parts of the old river beds being left as shelves or terraces along the sides of the deepened valleys. Every river-valley of Europe has terraces along its sides; in the valley of the lower Thames there is a terrace 120 feet above the river level, another at about 100 feet, a third at 50 feet and a fourth at 25 feet.

There is no episode in the annals of archaeology so romantic as that which centres round the French exciseman, Boucher de Perthes. It was he who discovered that valley terraces contained documents relating to the history of early Man. In 1825 he was placed in charge of the customs of the town of Abbeville, situated in the estuary of the Somme. Near the town, sand and gravel were being dug from pits situated in the old terraces, and workmen often flung aside stones which they named "thunderbolts."

Boucher de Perthes became interested in them; after studying them he came to the conclusion that they could have been shaped, not by Nature, but only by the hand of Man, and were in reality ancient stone axes or weapons. The beds of gravel which yielded "thunderbolts" also contained the fossil bones of extinct animals. This discovery in no wise

daunted the exciseman, but it confirmed the opinion of onlookers that his mind was "touched," for, said they, "these fossil animals are pre-diluvian, and does not all the world know that Man was not even created in their time?"

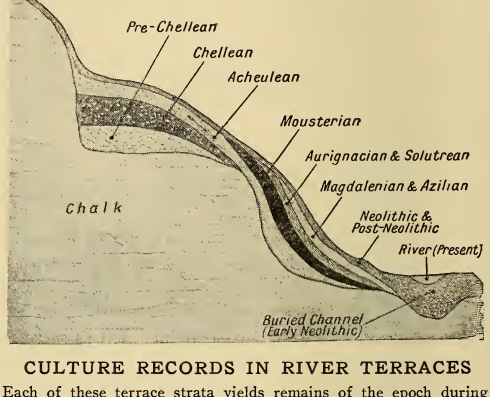
Nevertheless, Boucher de Perthes went on collecting and examining, and although in 1847 he published a great work on his discoveries, all the world remained sceptical until 1858, when certain English geologists came to his aid. They examined his "thunderbolts" and his fossil bones; they went to the pits and verified his discoveries; they were convinced that the "thunderbolts" were shaped by Man.

Man, therefore, must have been living in the Somme valley when the 100-foot terrace was being laid down in the bed of a running river, and when strange forms of animals were living in France. When the English geologists returned to England they soon found in the terraces of the Thames valley the same kinds of "thunderbolts," or palaeoliths, and the same kinds of extinct animals as they had seen in the sand-pits on the Somme. Thus the art of deciphering Man's history from records made by rivers began.

We have already epitomized cave history by giving a diagrammatic section of an ideal cave; we shall sum up terrace history by combining records chosen from a whole series of valley deposits, giving it the ideal form set out in this page. In the more superficial or later strata of the lower terraces we find the same records as in caves—the same sequence of flint implements, the same kinds of extinct animals and the same forms of human bones. We may thus pass over the more recent records of the terraces—those of the Magdalenian, Solutrean, Aurignacian and Mousterian epochs—merely mentioning that they show the disturbances of ice action and, therefore, save the oldest part of the Mousterian, fall within the last of the glaciations.

We thus come to an interglacial epoch, in which Europe enjoyed a warmer climate than that of today. In this long interval falls the period of Acheulean culture, one which we have reason to suppose equalled in its duration all subsequent cultural periods put together—from the beginning of the Mousterian to the present—a period to which a provisional estimate assigns 40,000 years. All through this period a peculiar form of hand-axe, sometimes called *coup-de-poing*—the "thunderbolt" just mentioned—was fashioned and used.

Still deeper in the terraces we come across the older records of the Chellean period, which preceded the Acheulean and occupied an earlier and even warmer part of the same interglacial epoch, or, as some believe, to a preceding interglacial period. The Chellean hand-axe is a larger implement and shows bolder workmanship than that of the Acheulean period. If we assign 40,000 years to the duration of the Chellean fashion in flint implements—a very modest figure when we consider the magnitude of the land



CULTURE RECORDS IN RIVER TERRACES

Each of these terrace strata yields remains of the epoch during which it was laid down, so that we may retrace the history of Man in the Pleistocene period; here the highest terraces bear the oldest strata. (Diagram by Sir Arthur Keith.)

changes which took place during its reign —then we are carried backwards to a point in Man's evolution which lies a hundred and twenty thousand years behind us.

Beyond the Chellean lies a vast, almost uncharted, hinterland of cultures to which, in the present state of our ignorance, we give the name pre-Chellean. The records of this period are found in the deeper strata—the basal strata—of the 100-foot terrace of our river valleys. Pre-Chellean records carry us to the beginning of that period of time to which geologists give the name of Pleistocene. The period has a deep significance to the student of Man's evolution. It was with the dawn of this period that the living animals of the world assumed their present-day features; we may well suppose that Man shared in the evolutionary movement of the time and began to put on those features which mark his present-day descendants.

With the beginning of the Pleistocene period the living world began to take on a modern aspect, and hence zoologists place that period as the first of a new series of chapters in the world's history —a series to which they have given the name Quaternary. How long ago this new series began we cannot yet tell with any degree of accuracy; estimates of a million years and more have been made from time to time, but the allowance of two hundred thousand may be regarded as representative of the more moderate, perhaps ultra-moderate, opinion which now prevails. Thus by means of terrace history we can follow Man's evolutionary tracks for perhaps 200,000 years.

It was great good fortune, from the historian's point of view, that Man began to use stones as implements and weapons so early in his career. We are enabled to trace him back to the beginning of the Pleistocene by following the track of his discarded stone tools; we have even found the place, or "floors," on which he manufactured them. Fossil bones of the men who shaped these tools, however, are but seldom found.

In spite of all the searching and excavation which have been carried out along the river valleys of Europe during these past fifty years, we have found fossilized bits of but two individual Europeans of pre-Chellean times; one of these was the Heidelberg Man—all we know of him is merely his lower jaw. It was found almost at the bottom of a great valley terrace laid down by a tributary of the ancient Rhine; over the stratum in which the jaw lay there were superimposed 78 feet of other deposits.

The stratum which yielded this jaw also contained the fossil bones of the kind of animals which prevailed in Europe at an early point of the Pleistocene period; clearly Heidelberg Man was their contemporary. From a lower jaw much can be told concerning the individual of which it formed a part. In this case the mandible is human, but it is crude, massive and strong beyond anything known amongst present-day races. The teeth, although large, form an even series; the canine or eye tooth, which projects as a dangerous weapon in the mouths of anthropoid apes, has in Heidelberg Man fallen into rank with its neighbor. The teeth, in certain of their features, and the bone-work of the jaw itself, although very different from the teeth and jaws of the most primitive of modern races, are of a kind which foreshadows the teeth and jaw of Neanderthal Man—that curious type which, as we have seen, occupied Europe throughout the early cave period.

Of the other type of Man who lived in Europe in pre-Chellean times we know much more. His fossil remains were found in the oldest part of a terrace laid down by the Sussex Ouse in England early in the Pleistocene period. All lines of evidence lead us to the belief that this Sussex deposit, near Piltdown Common, eight miles to the north of Lewes, is older than that in which the Heidelberg jaw was found; if it had been discovered in the valley of the Thames, the Piltdown deposit of gravel would have been assigned to the deeper or pre-Chellean series of the 100-foot terrace.

The discovery was the result of an intelligent anticipation on the part of Charles Dawson, who practised as a lawyer in Lewes and devoted his spare hours to a study of the geology of this part of Sussex. In 1908, eight years before his lamented death at the age of fifty-two, he found a country road being mended by a kind of flint which was new

to him—a kind which he knew had been used by early Man as material for tool-making. He inquired where the road metal had come from, and was directed to a shallow pit on a farm on the verge of Piltdown Common. He visited the pit from time to time, maintained friendly relations with its workmen and after a few years obtained a small, thick plate of bone which he suspected had formed part of a primitive human skull. It was not until 1911 that he recovered a much larger piece of the same skull, and saved it from being used as road metal.

He then, in company with Sir Arthur Smith Woodward, began to dig in the pit, and they were presently rewarded by the discovery of further fragments of this remarkable individual. They also found fossil bones of extinct kinds of animals and flint implements of two classes—those of a pre-Chellean type and others still older, which are usually named "eoliths."

Enough of the skull was found to give a true index of its original size and shape; from its interior it was possible to take a plaster cast, which revealed the size and characters of the brain that guided this early inhabitant of England through the perplexities of life. In point of size the Piltdown brain rises above the average given to the lower races of living Man; nevertheless, in certain of its features it is simple and primitive, more so than is the case of any modern Man. Yet in their cranial characters the Piltdown race made a remarkable approach to modern Man, more so than in the case of Neanderthal Man—whose cranial features were distinctly more ape-like. On the other hand, the Piltdown race was decidedly more ape-like in conformation of face.

One half of the lower jaw was found; it is a curious blend, so far as its teeth and framework are concerned, of Man and ape. The canine or eye tooth, reduced though it was, had the pointed form seen in young anthropoid apes; in the region of the chin the lower jaw was molded exactly as in chimpanzees, whereas in this region the Heidelberg jaw, massive although it is, yet possessed features which are essentially human. Thus at Piltdown was found a stage in the history or evolution of Man in which the brain had almost reached the modern human level, and yet the face in its size and shape remained a blend of Man and ape.

If Man has evolved from a lower ape-like form, and all the evidence at our disposal supports such an inference, then we need not be surprised if, in searching Man's geological past, we encounter a stage in which certain simian traits are still preserved. The discovery at Piltdown revealed to us that near the beginning of the Pleistocene period there was still alive in England a human race which, although it had reached Man's estate in size and brain, yet retained much of the ape in jaw and face.

So impressed was Sir Arthur Smith Woodward with the ape-like features of Piltdown Man that he did not include him in the genus *Homo,* but assigned him to a genus of humanity which had become extinct—a genus of which we knew nothing until the Piltdown discovery was made. To this newly discovered extinct genus he gave the name *Eoanthropus*—which, being interpreted, signifies Dawn Man.

That Piltdown Man acted and reacted in a human way we may infer not only from the size and characters of his brain-cast, but also from certain other facts we know concerning him. We know some of the stone implements which were fashioned in his time; they show intention and skill. In the spoil-heap near the gravel-heap at Piltdown Mr. Dawson found a fossilized slab of bone which had been shaped by the hand of Man to serve some purpose; in size and shape it somewhat resembled a cricket bat. The condition of fossilization was in all respects similar to that of the bones found in the deepest layer of the Piltdown deposit.

A full inquiry showed that it had been cut from the thigh bone of an elephant of very large size—larger than the mammoth; a species of elephant which became extinct in England very soon after the Pleistocene period began may have provided the material for this implement. Piltdown Man had the intelligence to conceive of such an implement and the skill of hand to shape it from such a mass of obdurate material as is the thigh bone of a great elephant. Nay, we do not go beyond the bounds of legitimate inference when we draw the conclusion

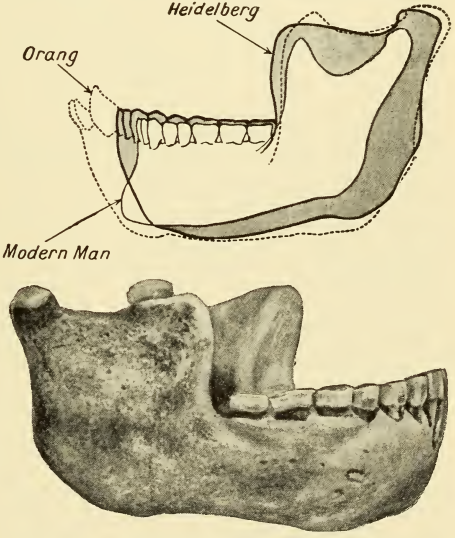
that Man was already, early in the Pleistocene period, a daring hunter and knew how to capture great game.

The evidence obtained at Piltdown is sufficient to assure us that shortly after the dawn of the Pleistocene period Man was already becoming definitely human in shape, thought and action. We have now to set out on a new journey, one which will carry us into the geological period which preceded the Pleistocene—that to which geologists have given the name Pliocene. For this purpose we have to leave the records that are preserved for us in river valleys and seek for older repositories.

In Pliocene times, and also in the earlier part of the Pleistocene, the rivers of northwestern Europe were converting the basin of the North Sea into a great geological museum for the preservation of contemporary records. In the course of time the basin of the North Sea became so filled that the estuaries of the Thames and Rhine were not where they are now, but lay to the north of the Wash and Dogger Bank, England being widely joined to the opposite parts of the continent by an extensive plain. Most of this Pliocene plain has now gone, but a fringe still remains along the coast of East Anglia.

If human beings lived in England during the deposition of the North Sea plain and adjacent estuarine lands, then the Pliocene formations of East Anglia are the most likely of all to yield traces of their existence. In 1909 Mr. J. Reid Moir, whose home is at Ipswich, began a systematic search of the Pliocene deposits of East Anglia; such deposits are opened and quarried by manufacturers of cement and makers of brick, and fossiliferous beds and old land surfaces are often laid bare. Very soon he began to observe that at such levels there were to be found flints which showed definite evidence of human workmanship. By 1935 he was in a position to declare that the "sub-crag" or pre-Pleistocene implements represented not one, but four separate "cultures."

A search of many years placed him in possession of a collection of such implements. In shape and in mode of chipping they differed from the types which are met with in pre-Chellean and Chellean deposits. He also searched for traces of Man along the foreshores of Suffolk and Norfolk, because with every storm the waves beat against soft crumbling Pliocene cliffs and spread out their more solid contents on the adjacent beach. Amongst the outwashings of the foreshore he has, from time to time, had the fortune to find shaped flints which in the opinion of many experts are to be unhesitatingly accepted



PRIMITIVE EUROPEAN'S MASSIVE JAW

Of the two types of pre-Chellean Man discovered in Europe, the Heidelberg and the Piltdown, the former, a primitive type of Neanderthaler, is known only by a lower jaw. As we see above, this is very different both from a human jaw of today and from that of an ape. The canine teeth, however, are actually less ape-like than those of modern Man.

as showing definite evidence of human workmanship. But of the fossil remains of the beings who shaped these stones not a trace has yet been found.

Before we proceed further in our search for Pliocene representatives of humanity, we must first form an estimate of the duration of this period. Geologists have calculated that, if the deposits and strata laid down during the Pleistocene period could be superimposed, their total thickness would amount to about 4,000 feet; a similar calculation for the Pliocene period gives rather a higher figure: 5,000 feet. If we accept the thickness of deposit as a rough measure of geological time and allow 200,000 years for the formation of Pleistocene strata, then we must, on the same scale, allow at least 250,000 years as the time needed for the accumulation of Pliocene strata.

The deepest and oldest level from which Reid Moir obtained primitive stone implements lies about two-fifths of the way down. If, then, we accept the evidence as it stands today—and much of it is highly speculative—we must assume that some 300,000 years ago there existed in that part of the world which has become western Europe human beings with sufficient intelligence to invent tools and sufficient skill to use them.

Nor are the implements discovered by Reid Moir in East Anglia the oldest records of Pliocene Man which have been found in England. Up in the high plateau of the North Downs of Kent there are now no streams, but at one time there must have flowed powerful rivers, for we still find patches and beds of gravel which indicate their former existence. In these deposits of Pliocene gravels Benjamin Harrison began to search for implements in 1864, and found certain flints which he believed had been deliberately chipped by human beings in Pliocene times to serve a definite purpose. Harrison's implements became known as "eoliths," and for many years their human origin was regarded with the utmost scepticism. As archaeologists became more expert in distinguishing between flints which had been accidentally and those which had been intentionally chipped, this scepticism became less and less, and when Harrison died in 1921, aged 83, he had won over to his way of thinking the majority of his critics. If it be true that Man in the course of his evolution became a tool user only when his brain reached a certain stage of development, then eoliths may well represent the workmanship of his apprentice hand. Reid Moir regards the Kentish eoliths as ruder and earlier tools than those which he has collected in East Anglia. In the Pliocene deposits of Belgium Rutot, the veteran conservator of the Royal Museum of Brussels, has found many examples of what he regards as Man's early attempts to shape flint into tools and weapons.

Up to this point we have focused our attention on the geological deposits formed in the basin of the North Sea during the Pliocene period. [At the time at which this is written there is a tendency among geologists to transfer the Cromer and other deposits in East Anglia from the end of the Pliocene and place them at the beginning of the Pleistocene epoch.] Similar processes were then at work in all the lands and seas of the world; we find Pliocene deposits along the shores and hinterlands of the Mediterranean; they occur away in the high plateaux of central Asia. It is very probable, as Dr. Henry Fairfield Osborn expected, that these central Asiatic deposits of the Pliocene period will yet yield to us the missing and critical stages of Man's evolution.

Up to the present there have been found the remains of only one specimen of Pliocene humanity, and these were discovered in strata laid down by a river in the eastern part of the volcanic island of Java during Pliocene days. There are many who hold that these strata should be regarded, not as late Pliocene in date, but as early Pleistocene. The strata are now exposed as a cliff fifty feet in height, standing on the eastern bank of the Bengawan, a stream which, rising in the central part of Java, takes a northeasterly course to the sea. Here in 1891 came a young surgeon of the Dutch colonial army named Dr. Eugène Dubois. As a medical student in Holland he had speculated on the possibility of Man's evolutionary stages being found in Java, and entered the colonial service to test his theories on the touchstone of fact.

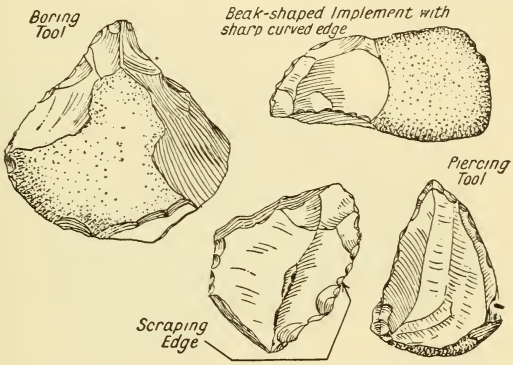
Near the foot of the cliff on the eastern bank of the Bengawan is a stratum

particularly rich in fossil bones; as the stream eats into this stratum fossiliferous contents become strewn along its bed. Fossil bones of many kinds of extinct mammals belonging to species and genera similar to those which lived in India during Pliocene times were particularly abundant. Dubois set his workmen to quarry the stratum at Trinil, and after digging for three seasons found fossil fragments of a strange kind of being to which he gave the name of *Pithecanthropus,* or Ape Man, because he believed that he had found what all the world had long talked of, but which no man had seen—the veritable transitional form or "missing link," which marked the passage from ape to Man.

We have to admit that the deposits from which this curious being was recovered were laid down in later Pliocene times; it is possible that Pithecanthropus and his mates—his parents, cousins and children—were alive in Java when the Pliocene deposits of East Anglia were approaching completion. On our scale of reckoning that would be between 200,000 and 300,000 years ago. Having thus indicated his geological date, let us see what kind of being Pithecanthropus was. All that we have to guide us is a skull-cap, a thigh bone and three teeth—one of them an upper wisdom tooth or third molar.

The skull-cap, examined superficially, recalls that of the lowliest anthropoid—the gibbon. A gibbon, to have a skull-cap of such a size, would require to be as tall as a man instead of being—as all living species of the gibbon are—about the height of a five-year-old child. The roof of the skull is flat and low; there is practically no forehead, for the great shelving ridges over the eye sockets run directly backwards into the crown; the back of the head—the occiput—in place of being as full and bulging, as it is in modern man, was depressed and greatly curtailed.

Man's essential traits are his intelligence, his educability and his intensity of feeling; these qualities he owes to his brain. The story of Man's evolution is, in reality, that of the evolution of his brain, not of the outward appearance of his skull. When the skull-cap of Neanderthal Man was discovered in 1857 certain skilled anatomists said that it betokened an anthropoid ape rather than a human being, for it had the massive eyebrow ridges of a gorilla and the crown of the head was low, wide and flat. Subsequent discoveries have shown that in mass of brain Neanderthal Man exceeded many of the living races of Mankind, and his intelligence and skill are known to us by his bold and beautiful workmanship in flint.



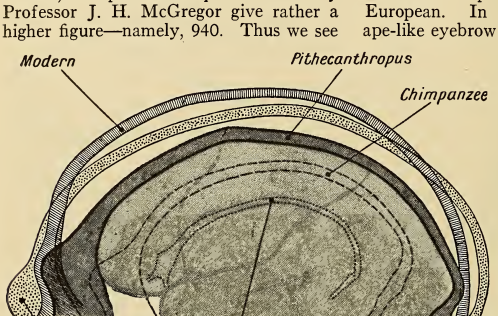
EOLITHS FOUND IN SUFFOLK

Eoliths—roughly shaped flint implements—have been discovered in Pliocene formations in East Anglia, and show that even in this remote period Man was possessed of considerable intelligence. The four seen above were discovered by Mr. J. Reid Moir.

By permission of Mr. J. Reid Moir

In point of size the brain of Pithecanthropus—or Java Man—falls just below the human minimum. Among the aborigines of Australia, the brain space or cranial capacity varies in most individuals between 1,300 and 1,400 cubic centimeters (45.8 and 49.3 fluid ounces), but occasionally it may drop in certain in-

dividuals—particularly women—to 1,000 or even to 930 cubic centimeters. For men and women to take a useful share in life of their tribe it seems necessary that their brain mass must rise above a 950 cubic centimeters standard. In his latest inquiries Dr. Dubois has been led to the opinion that in this specimen of Pliocene Man the brain must, in its intact state, have measured 900 cubic centimeters; independent inquiries made by Professor J. H. McGregor give rather a higher figure—namely, 940. Thus we see that the fossil Man of Java, in point of brain size, stood on the threshold of humanity. We may well infer that his brain was just beginning to understand the simplest of things and that his behavior was still largely dominated by instinct.



MAN NOT FAR REMOVED FROM THE APES

Although in shape the skull of the Java Man is more ape-like than that of Neanderthal Man, and very different from a modern human skull, it differs considerably from those of chimpanzees and gibbons. In this diagram the cast of Java Man's brain is shown in the interior of his skull.

Let us see how the Java Man stood in this respect to the largest-brained of living anthropoid apes—the gorilla. In the average male gorilla the cranial capacity is about 520 cubic centimeters, but there are individuals which rise as high as 650 and others which fall as low as 480. We have seen that the skull-cap of the Java Man has a striking resemblance to that of a gibbon, but when we compare their brain-casts we see how different they are both in form and size: in the largest-brained gibbon measured so far the capacity was only 150 cubic centimeters, whereas in the Java Man it amounted to at least six times as much.

If we carry our comparison further and contrast him with higher living races we find that in size of brain he fell short of the average for male Europeans by about 560 cubic centimeters, for we may take 1,500 as the amount which represents the cranial capacity of the average male European. In spite of great beetling ape-like eyebrow ridges and receding foreheads, individuals of the extinct Neanderthal species of Mankind often exceeded this amount.

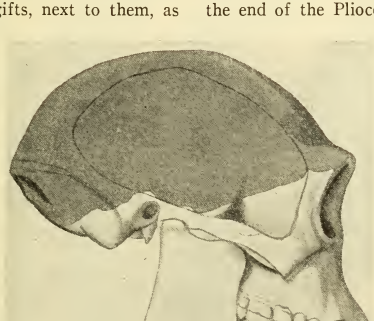
In point of size, then, the brain of this early representative of humanity rises far above that of the largest known anthropoid ape and just reaches the bottom of the human scale.

Thus the discovery made by Dr. Dubois tells us that in the Pliocene period—at least in the latter part of that period—there were in existence crudely fashioned human beings whose brains and mental faculties fell far short of those attained by modern Man. We cannot tell for certain whether or not they had acquired the gift of speech, but in the brain-cast of the Java Man we can detect, in an elementary condition, all those areas which are concerned in speech, and probably some crude system of voice signalling had appeared. At least we may well suppose that Man's early attempts at speech are as old as his first efforts at making tools.

The teeth of Pithecanthropus were human in shape, but of large size. Dr. Dubois, in another part of Java, but in a stratum of the same age as that which yielded the skull, teeth and thigh bone, found part of a lower jaw; it contains the socket of the canine or eye tooth. This tooth in Piltdown Man, it will be

remembered, was large and pointed, as in a young anthropoid ape, but the socket in the Java specimen is not large; in Java Man the canine teeth had sunk into the same dental rank as their neighbors, just as was the case in the Heidelberg jaw and as is the case in all living races of Mankind.

If Man's mental faculties are the most distinctive of his gifts, next to them, as marking him off from all other living animals, is the manner in which he holds his body and the mode in which he runs and walks. To assert that his is the only body modified to an erect posture is to go beyond the bounds of truth; we shall see that all the anthropoid apes, when they are in their natural arboreal habitat, carry their bodies in an erect posture; every bone and muscle in their organization is set and fashioned for this end. And yet their feet are still shaped as grasping organs.



JAVA SKULL RESTORED

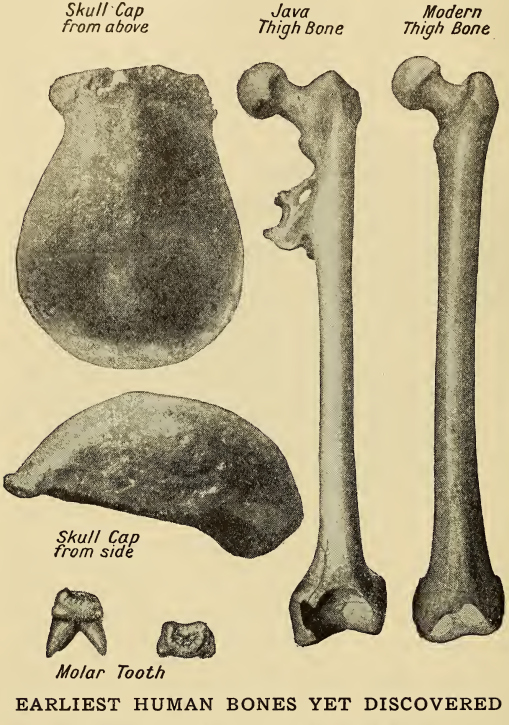
The brutish appearance of Pithecanthropus may be deduced from this restoration by Dr. Dubois of his flat-roofed, low-browed, ape-like skull.

Man has the same posture, only his feet have become modified as organs on which he can support the whole weight of his body. The human foot is shaped also to serve in Man's peculiar mode of bipedal progression. For this end the bones and muscles of his thighs and hips have undergone many structural changes; so, too, have his backbone and the very complicated system of muscles which balance it and move it. In their evolution all these three parts—foot, thigh and backbone—have been linked together; their structural changes have been coordinated. If we find a fossil bone of the foot or of the thigh or of the backbone we can tell whether or not the animal of which it had formed part had acquired Man's mode of progression. Turning, then, to the fossil thigh bone of the Java being, we find that it is long and slender and in every respect human; the individual of which it formed part must have held his body, run, jumped, walked and squatted much as we now see natives of Australia or of Southern India doing today.

Here, then, we have assurance that Man's posture was fully evolved before the end of the Pliocene period, and that if we are to seek the early stages in its evolution we must carry our search into a more distant geological period. But before doing so it may be well to call attention to the important fact that our remote forerunners were men in posture long before they were men in mind, and that even so late as the end of the Pliocene period and the beginning of the Pleistocene the outward marks of the ape were still plainly visible in their skulls and jaws. In the decade which elapsed between 1925 and 1935 a series of discoveries were made which threw new light on the problem of Man's evolution. These were made in four widely separated parts of the earth—in China, in Java, in Palestine and in Europe.

Thirty-seven miles to the south-west of Peking, at a place named Chou Kou Tien, there is a low range of limestone hills which are being quarried for commercial purposes. A Swedish geologist, Dr. J. G. Andersson, who visited the hills, collected bones which were embedded in the hard breccia. This breccia had accumulated on the floors of ancient caves and filled them up. Among the bones, which proved to be those of extinct animals, were found two teeth recognized as human. In 1927 excavations were begun, and a molar tooth was found which was taken to Professor

Davidson Black, who taught anatomy in the Union Medical College, Peking. (He died in Peking in 1934. His death at an early age robbed anatomy of one of its foremost exponents.) With great daring, on the evidence of this one tooth, he declared that a new genus of early Man had been discovered which he named *Sinanthropus pekinensis*—usually spoken of as Peking Man. Excavations were then pushed forward year by year by the Geological Survey of China with astonishing results. By the end of 1935 fossil fragments, representing twenty-five individuals, had come to light. Two of these were represented by almost complete skulls, eleven by fragments of jaws or of skulls, the others by teeth. The hill at Chou Kou Tien proved to be a vast mausoleum of ancient Man—the most remarkable ever opened. All the individuals extricated proved to be members of the same extinct genus—Sinanthropus. The superimposed strata had a depth of over 160 feet; from bottom to top the fossil remains of Sinanthropus and of extinct animals—all of early Pleistocene forms—occurred. Also, in view of the great antiquity of the deposits—oldest Pleistocene—to everyone's surprise there was clear evidence that this ancient type of Man had discovered the use of fire, for there were the black bands made by hearths, and had learned how to make stone tools—most of them of crude workmanship. Only in the last or uppermost strata did stone tools of an improved technique appear.



EARLIEST HUMAN BONES YET DISCOVERED

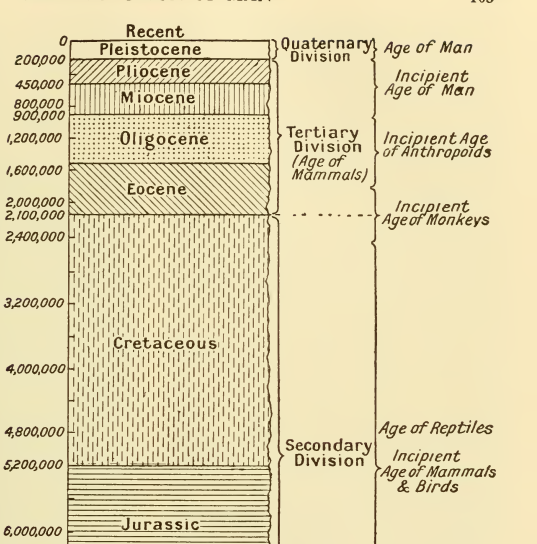
The most interesting of the Trinil bones is the skull-cap, which, although resembling a gibbon's, proves that Java Man was more intelligent than any known ape. The large teeth have both human and simian affinities. His thigh bone (compare the human bone alongside) shows that Java Man walked erect. These are the only relics of Pliocene humanity so far unearthed.

After Dubois

What kind of men were these early inhabitants of China? Their skulls have flat roofs ending in front in great supraorbital ridges—very similar to what is to be observed in the skull of Pithecanthropus. It is possible that these two—Peking man and Java Man—were contemporary forms. Peking Man had a

rather larger brain than the Java Man. The only skull of Peking Man which has been restored so far had a brain capacity of about 1,000 cubic centimeters. But the differences in tooth and jaw form compel us to place Peking Man and Java Man well apart, for they represent different kinds or genera of evolving humanity. Strange to say, there are resemblances of an intimate character between the teeth of Peking Man and those of existing Mongolian races—resemblances which raise the suspicion that in the caves of Chou Kou Tien has been discovered a remote ancestor of the modern Mongolian type.

We now turn to Java, where Dr. Eugène Dubois discovered the fossil remains of Pithecanthropus in 1892. In 1932 Dr. F. F. Oppenoorth unearthed, only six miles from the site of Dr. Dubois' discovery, fossil remains of a rather higher type of Man. These belong to a later date than those of Pithecanthropus, for the strata which yielded them were laid down in the middle of the Pleistocene period, whereas Dr. Dubois' discovery was made in strata laid down at the end of the Pliocene or at the beginning of the Pleistocene. The date of this later kind of humanity—*Homo soloensis* his discoverer has named him—is approximately that of Neanderthal Man in Europe. The tools of Solo Man are of many kinds, but all of them are crude. Altogether parts of eleven individuals have been found. The most complete skull is an enlarged and improved form of the skull of Java Man (Pithecanthropus). On the scale of time used here these two Javanese fossil types are separated by an interval of at least 100,000 years. Is Homo soloensis the evolved and improved descendant of Pithecanthropus? The brain has become enlarged, measuring 1,300 instead of 930 c.c.



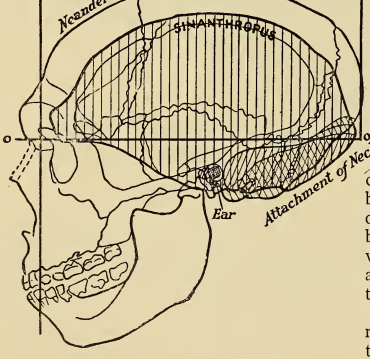
LATER GEOLOGICAL HISTORY

The Pleistocene period, in which Man became dominant on earth, is very much shorter than the periods of his emergence from lower mammalian forms. These periods are in turn recent and brief when compared with those during which terrestrial vertebrates have existed.

Drawing by Sir Arthur Keith

Solo Man has a resemblance to another fossil type known as Wadjak Man. This, too, was found in Java by Dr. Dubois, but in a still later geological deposit—upper or late Pleistocene. Dr. Dubois was struck by the resemblance of the Wadjak skull to the skulls of the more primitive type of Australian aborigine—especially to an early fossil form which is believed to have come from late Pleistocene deposits in Queensland. Here, again, the suspicion arises that Pithecanthropus is not, as we had supposed, a form that died out leaving no progeny, but represents a stage in the evolution of the native peoples of Australasia.

From Java we pass to Palestine. In 1925 Mr. Turville Petre found, while excavating a cave near Lake Galilee, part of a fossil human skull. It came from strata of middle Pleistocene date and showed resemblances to, and some differences from, the skulls of the Neanderthal men of Europe. The stone implements of this early inhabitant of Palestine were fashioned in the Mousterian manner—the manner used by the Neanderthalians of Europe. Then, in 1928, Miss Dorothy Garrod came on the scene and made a series of very remarkable finds. Her excavations were made on behalf of the British School of Archaeology in Jerusalem, and she had the good will of the Department of Antiquities of the Government of Palestine and the active assistance of Mr. Theodore McCown of the American School of Prehistory. There were certain reasons in 1928 why caves situated in the western flank of Mount Carmel—caves which look across the plain of Sharon to the Mediterranean—should be scientifically and thoroughly excavated. By the spring of 1933 Miss Garrod had completed a section of the strata of one of the most wonderful caves ever opened. The deposits above the floor had a total thickness of 85 feet; from bottom to top they contained records of Man and of beast. The lower strata yielded implements worked in the Acheulean manner; on the final layers were fragments of pottery left by Bronze age Man. On the time-scale employed here the deposits of the Carmel caves covered a period of 80,000 or 100,000 years. The richest deposits were those of the Mousterian period—especially of the earlier part of this period. In deposits of this age in the main cave, but more especially in an adjoining small cave—known as the Kid's Cave—there were unearthed fossil remains of eleven individuals, representing men, women and children. They had been deliberately buried, a remarkable fact when we consider the early date at which these burials were made, for the geological evidence places the men of Mount Carmel before the last Ice Age in Europe, and well within the preceding interglacial age. They are, therefore, of older rate than most of the Neanderthalians of Europe.



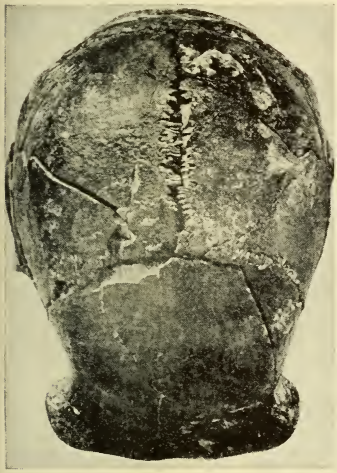
PEKING AND NEANDERTHAL

In this drawing we see compared the skulls of Peking Man (shaded area) and the La Chapelle-aux-Saints Man of Neanderthal type. The almost parallel curve of the two skulls is very noticeable, as also is the huge eyebrow ridge of the Peking skull.

Drawing by Sir Arthur Keith

Mr. McCown has published a preliminary account of these very ancient Palestinians. They were a strange people, possessing features which show a definite relationship to the extinct Neanderthal type of Europe, but also possessing quite as many features which ally them to Modern or Neanthropic Man. Indeed, it has been suggested that they are really a hybrid people, representing a mixture of the Neanderthal and Nean-

thropic stocks. We have no evidence of the existence of a primitive form of Neanthropic Man when these Palestinians were alive—save, perhaps, Rhodesian Man of South Africa. If evolution is true and if we are right in supposing that Neanderthal Man and Neanthropic (or Modern)



SINANTHROPUS' SKULL

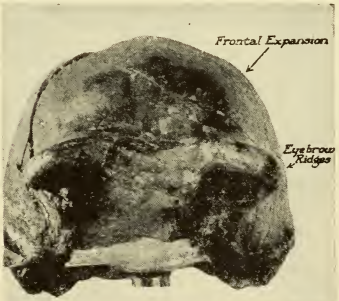
Above is seen a bird's-eye view of the cranium of Peking Man, a specimen remarkable in its completeness. This fact is further demonstrated by the front view shown in the right-hand photograph.

Geological Survey of China and Prof. Davidson Black

Man are descended from a common ancestor, then we have reason to expect that types intermediate to Neanderthal and Neanthropic Man should also have come into being. The ancient Palestinians appear to represent such an intermediate evolutionary type. The ancestral type of the Modern European has still to be discovered. The form of humanity discovered in the caves of Mount Carmel appears to approach the ancestral type of which we are in search.

Meantime, it is sufficient to state that the Palestinians (*Palaeoanthropus palestinensis* is the technical name for this extinct race) show an exceedingly high degree of variation in size of brain—but the mean falls somewhat below that of modern Europeans.

In this brief survey of the more important advances made in our knowledge of fossil Man we now pass from Palestine to Europe. Two important discoveries are to be registered, one made in 1929 near one of the gates of ancient Rome, and the other at Ehringsdorf, near Weimar, Germany, in 1925. In both cases the fossil remains were those of Neanderthal Man, and in both cases the geological evidence placed the date of entombment in the interglacial period which preceded the last (Würm) glaciation, whereas all other discoveries of Neanderthal Man in Europe have been assigned to the earlier phase of the last glaciation—with one exception. The exception is Krapina in Croatia, Yugoslavia, where a large assortment of fossil remains of Neanderthal Man was found in the earlier years of the 20th century. The Krapina men also flourished in the last interglacial. These interglacial discover-

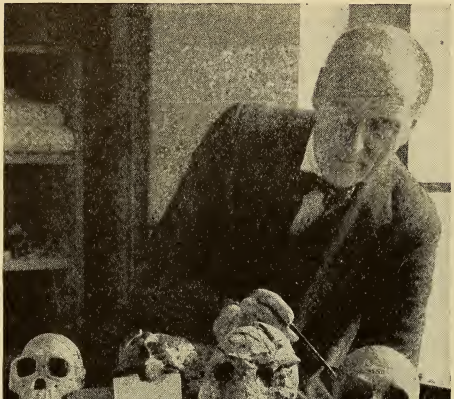


ies carry the chain of Neanderthal links back to the still older type discovered at Heidelberg in 1907.

By means of fossil bones and rudely fashioned stone tools we have traced Man's history through the Pleistocene into the Pliocene period, and we must now set out again on a journey which will carry us into still more distant phases of the earth's history. Before doing so, however, it will be well to give a conspectus of the geological periods into which we are about to enter. It will be remembered that we employed a diagram to epitomize

the chapters of Man's cave history (see page 91); we did the same for his terrace history; we propose to use the same method to summarize these later geological chapters with which we are now to be concerned.

From the diagram in page 103 it will be seen that, as we pass from the Pleistocene into the Pliocene, we cross a geological Rubicon, for as we cross this frontier the species of mammals which now inhabit the earth seem to be replaced by others which differ from them in outward appearances. Hence some geologists make the Pleistocene the first of a new series of chapters of the earth's history. To this series is given the name Quaternary; its first chapter, the Pleistocene, ended when the ice-sheet retreated to the Arctic circle; the second chapter opened some ten or twelve thousand years ago, as the world of humanity began to take on its modern aspect, and when it became apparent that Man was destined to revolutionize and change the face of the earth.



SIR ARTHUR KEITH, DEMONSTRATOR

Here we see Sir Arthur Keith demonstrating, with four skulls, the evolution of Man. The skulls, from left to right, are those of a chimpanzee, of Neanderthal Man—a fragment only—Mount Carmel Man and Modern Man. The narrowing and more upright character of the modern head is well seen.

On the other hand, the Pliocene period, which lies on the farther side of this geological Rubicon, represents the fourth, and last, of another series of chapters—the series to which the title Tertiary is given. The preceding and third chapter of this series—the Miocene—covers a much longer period of time than does the Pliocene, its superimposed strata are estimated to form a total thickness of 9,000 feet, against 5,000 feet for the Pliocene. If deposition of strata went on at the same rate then, if we allow 250,000 years for the duration of the Pliocene, we must allow 450,000 for that of the Miocene.

The second of the Tertiary chapters—the Oligocene—covers a still longer period, for its collective strata are 12,000 feet deep; geologists provisionally estimate its duration at 600,000 years. Thus we reach the oldest or first of the Tertiary chapters—that which deals with the Eocene period. The depth of strata formed in this period was certainly equal to, if not greater than, that formed in the succeeding Oligocene period. We may thus take another 600,000 years as a provisional estimate of its duration.

[The figures here adopted by Sir Arthur Keith give a total of nearly two million years for the Tertiary Era. It should be pointed out that in the opinion of many geologists thirty million would not be an overestimate, and that no duration shorter than this can satisfy the demands of the physicists. In any case the figures given may be accepted as providing a convenient and accurate guide to the *relative* lengths of the periods under discussion.—EDITOR.]

The four chapters which deal with the Tertiary Era of the world's history are of prime importance to the student of Man's evolution, for they cover the rise of that great section of vertebrate animals which

give suck to their young and all of which, with a few exceptions, bear their progeny in a womb. The provision of a womb, in which the young may be sheltered and nourished, and reach developmental maturity, marks a stage in the general evolutionary advance which ultimately made the emergence of Man possible. With the dawn of the Eocene period mammals began to assume a great variety of forms; they became the successful and dominant vertebrate type; they supplanted more and more the reptilian types.

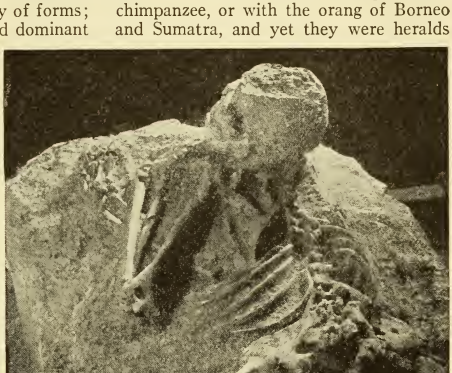
Seeing that Man is in every respect a mammal, it is useless to cross another geological Rubicon and seek for his birthplace in the Secondary section of the earth's history, for the chapters of that section cover the Age of Reptiles. Much less is it necessary for us to go still further back to that part of the immense Primary section of the earth's history where fishes and amphibia represent the highest achievements in vertebrate evolution.

Having thus viewed in outline the Tertiary section of the earth's history, we are in a position again to take up our quest for Man's origin. In the deposits of East Anglia we have followed the trail of his rude stone implements back almost to the middle of the Pliocene period; we have found in Java a representative of humanity who had been overwhelmed and entombed towards the end of the Pliocene period. That representative was ape-like in skull, primitive in brain, but altogether manlike in posture.

Clearly, then, we have to go farther back in time to find the evolution of Man's posture and the emergence of his brain from the anthropoid status. Hitherto, in their search for these transitional phases, students of Man's evolution have drawn blank. In none of the older Pliocene deposits have we yet found a bone or tooth which we can identify as definitely human; in no rock or deposit of that age have we found a stone which showed unequivocal evidence of Man's handiwork. Yet in strata of early Pliocene age there have been found traces of animals which provide an indirect clue.

We have found teeth and fragments of jaws which tell us that great anthropoid apes were alive in tropical jungles during early Pliocene times. The fossil apes were not identical with the gorilla or chimpanzee, or with the orang of Borneo and Sumatra, and yet they were heralds of the great anthropoid type—the type which is most akin to Man in structure. We know, too, that the small anthropoid apes, now represented by the gibbon and siamang, were then alive. So, too, were several genera of monkeys, none of them identical with present-day forms, yet related to them. In early Pliocene times Man's nearest allies certainly existed.

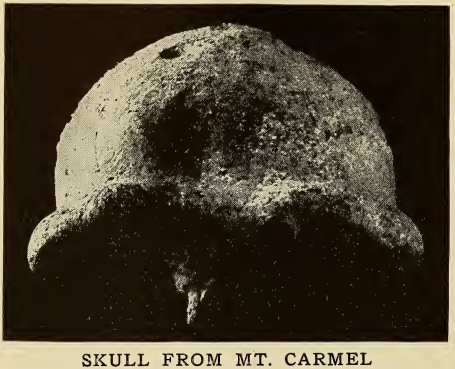
When our search is carried into deposits of the Miocene period we can show as yet nothing which is positively human, but no one who knows how short our search has been, and how many of our geological records lie unopened, will decide on this account that Man was not in existence during Miocene times.



EMBEDDED DEEP IN CARMEL'S ROCK

This almost complete skeleton is one of the most remarkable of all the finds in the Mt. Carmel discovery. Embedded and fossilized deep in the rock, from which it has now been partly separated, it is considered to be well over 100,000 years old.

Great anthropoids, small anthropoids and monkeys had certainly come into existence by the middle of the period. Was the Miocene ancestor of humanity still in the anthropoid stage then, but so like to the great Miocene anthropoids that we could not distinguish him from them even if we had the fortune to come across his actual remains?



SKULL FROM MT. CARMEL

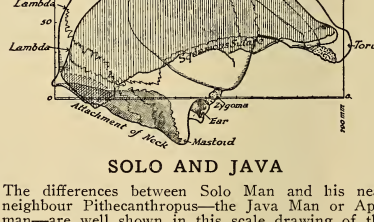
The Galilee skull, discovered in 1925, shows features which appear to relate it especially to the familiar European Neanderthal type, the most obvious of these being the very thick eyebrow ridges. This skull was accompanied by evidences of a Mousterian culture.

British School of Archaeology in Jerusalem and F. Turville Petre

Seeing how completely the human body had become adapted for bipedal progression before the end of the Pliocene period, it seems necessary to infer that human and anthropoid lines of evolution had parted at least by the beginning of the Miocene period—a matter of millions of years ago. It is possible that human and anthropoid lineages may have separated at an even earlier date—somewhere in the Oligocene period.

We are now to take another vast stride into the past—one which covers at least a million of years, and carries us to an early point in the Oligocene period (*see* table in page 103). At this time North Africa, including the desert regions of the Sahara and of the Sudan, was clothed with jungle and was drained by a mighty river which carried its sweepings towards the north and west and deposited them as an enormous delta in and near the lands which are now included in Lower Egypt. In the Fayum, sixty miles to the south-west of Cairo, these delta sweepings now appear as massive cliffs of stratified rock, rich in fossil remains of the varied forms of animal life which inhabited the northern half of Africa in an early part of the Oligocene period.

In 1910 important discoveries were made. Teeth and fragments of jaws of three curious kinds of primates were found. The first feature of these very ancient primates to seize our attention is their small size: they were no larger than the South American marmoset; in bulk of body the gibbon exceeds them just as much as the great anthropoids outdo the gibbon. Yet one of them, to which the name *Propliopithecus* has been given, clearly foreshadows the gibbon; it may well be the Oligocene ancestor of the small anthropoid ape of the Miocene period and also of our modern gibbons.



SOLO AND JAVA

The differences between Solo Man and his near neighbour Pithecanthropus—the Java Man or Ape-man—are well shown in this scale drawing of the two skulls. At least 100,000 years separated the two.

Drawing by Sir Arthur Keith

Another of these small fossil primates found in the Fayum seems to be an early generalized form, related to the ancestry

of the gibbon and to that of Old World monkeys, and also showing affinities to New World monkeys. In it one can see evidence also of a relationship to a still older form of primate—the Tarsioids of the Eocene period. This third fossil primate is small in size and may be an early stage in the evolution of Old World monkeys.

The Fayum gives us the only glimpse we have obtained so far of the anthropoid world of Oligocene times. That glimpse is sufficient to show us that we have reached very near to the evolutionary infancy of the anthropoid type—to a time when monkeys and anthropoids, which now seem so far apart, were still the closest of cousins in a structural sense. The records of the Oligocene rocks seem to tell us very plainly that in them we have reached a point in the world's history when there was neither Man, anthropoid nor monkey—but only the generalized beginnings of these great families.

Nor would our present search be carried into that more distant past represented by the vast deposits of the Eocene period, were it not that one of the most gifted anthropologists of today, Prof. F. Wood Jones, has given his support to a theory which carries Man's separation from other members of the primate order back to the Eocene—the phase when the mammalian stock began to differentiate into various lines of evolution.

In Eocene deposits, particularly in those of the United States and of France, are found the fossil remains of very many kinds of primate mammals. All are of small size, and the predominant type was that which has been perpetuated in the lemurs of today. There was also another prevailing type, one which was more monkey-like and to which the name Tarsioid has been given. Today this ancient type has but one living representative—the small, quaint, nocturnal, goggle-eyed *Tarsius,* or tarsier, of Bornean jungles. Professor Wood Jones believes that we shall ultimately find a series of fossil forms which will carry Man's origin right back to a Tarsioid ancestor of the Eocene period—thus giving human history, in the parsimonious scale employed by the present writer, a duration of between two and three million years.

MAN'S REMOTEST KIN?

From the Eocene ancestor of this Bornean tarsier Man's lineage may have sprung.

Photo, Dr. Le Gros Clark

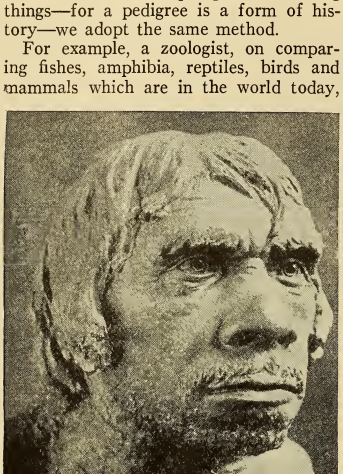
In the opinion of those who have given the evidence from all sources their close attention, this is most unlikely to be the case. In a later part of this chapter reasons will be adduced in favor of the thesis which derives Man and anthropoid from a common ancestry and maintains that the separation of Man from anthropoid did not take place until about the beginning of the Miocene period. Even on this theory Man's history has the respectable antiquity of about a million years.

We have now finished our survey of Man's history so far as it can be written from records which have been preserved for us in rocks and other geological deposits. But there are other sources besides geology which can supply the data of Man's remote history, and it is to one of these other sources that we turn.

By studying and comparing the grades of culture as manifested in diverse countries of the modern world it is possible to construct the evolutionary ladder by which Man's highest civilization made its ascent from lowest savagedom.

Such studies provide the materials from which we can write a history of Man's cultural ascent. Similarly, when we proceed to write the pedigrees of living things—for a pedigree is a form of history—we adopt the same method.

For example, a zoologist, on comparing fishes, amphibia, reptiles, birds and mammals which are in the world today,



NEANDERTHAL MAN

Despite his rather ape-like appearance, Neanderthal Man lived in caves, knew the use of fire and could manufacture excellent flint implements. This bust is modelled on the La Chapelle-aux-Saints skull.

Restoration copyright by Dr. J. H. MacGregor

would find many reasons for placing fishes at the bottom of the evolutionary ladder; amphibians and reptiles give him stages which lead on towards mammals; he, therefore, presumes that mammals, before they reached their distinctive positions, had passed through amphibian and reptilian stages in their evolution. Similarly, the student of birds is struck by the resemblance of their anatomy to that of reptiles, and presumes that birds, although so unlike mammals in outward appearances, must also have passed through amphibian and reptilian stages in their ascent from fishes.

It is true that the geologist has told the zoologist that in the record of the rocks fishes appear before amphibia and amphibia long before reptiles, and that reptiles antedate mammals and birds in the order of evolution; yet although the zoologist is grateful to the geologist for this information, he is quite capable of reaching reliable conclusions concerning evolutionary pedigrees by his own methods. For the zoologist has perceived that when Nature or Man modifies an old thing to serve a new purpose, the old thing is not necessarily discarded. When a certain form of fish was modified so that it could move on land by limbs and breathe air by lungs the original fish type still survived. When certain of the early reptilian types began to assume a mammalian organization, others still went on maintaining a reptilian conservatism. And when Man emerged from the anthropoid ruck, that more ancient type of primate still kept on.

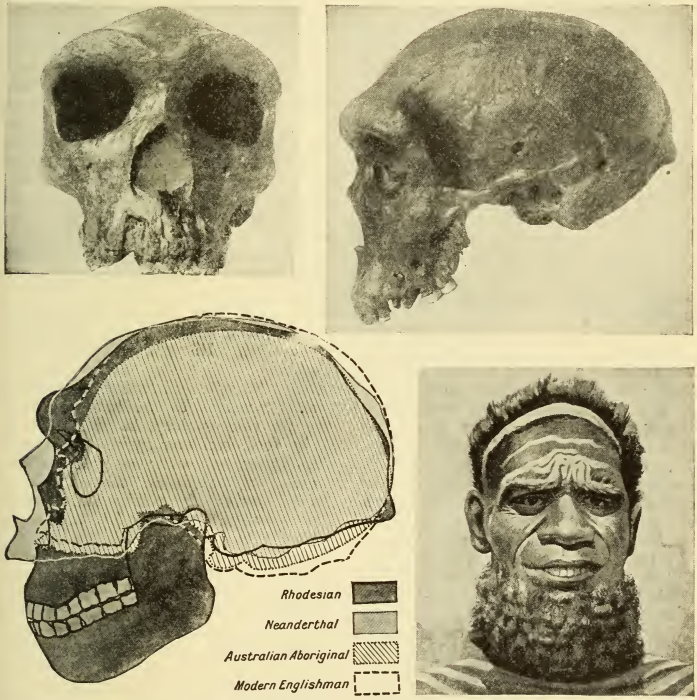
Indeed, it may be said that Nature has never sought to cover or hide her evolutionary tracks; by fossil forms buried in orderly sequence in the strata of the earth she proclaims the mode in which she has worked; amongst her living forms the comparative anatomist can still detect the stages by which she has reached the most daring results of her activities. We may be certain, then, that when we come to examine that corner of the animal kingdom where Man finds his place we shall find living forms which represent stages in his evolutionary ascent.

To illustrate the manner in which the biological history of Man is written we could not do better than consider the various living races of Mankind. If what has been said is true, then some of the living types must illustrate stages through which the highest type has passed in its ascent.

Among living races the Australoid type is unquestionably the lowest. Of the fossil types of Man so far discovered there is only one which, in the assemblage of its characters, can serve as a progenitor of living races of Mankind, and that is the remarkable being known as Rhodesian Man (*Homo rhodesiensis*). His skull and some of his limb bones were found in North Rhodesia, in 1921, in the same deeply fossilized state.

As to the exact geological antiquity of the Rhodesian type of human being there is still a lack of evidence; Rhodesian Man probably inhabited Africa when Neanderthal Man was living in Europe. His supra-orbital ridges are the most massive known in a skull which, in its other characters, is human. In this character Rhodesian Man resembled the gorilla, as he also did in the massive size of his face and jaws. His brain was almost equal to that of the average Australian aboriginal, but less highly evolved. In the form of his limb bones, and also in many of his cranial features, he resembled the Australoid type. Rhodesian Man, in a crude manner, foreshadowed the modern Australoid.

The zoologist uses the word family in a strange sense; when he speaks of the Human Family, he includes under this term not only all living races of Mankind, but such extinct types as those represented by Pithecanthropus (Java



SKULL OF ONE OF OUR MOST PRIMITIVE HUMAN ANCESTORS

In its eyebrow ridges and its length of face, the fossilized skull (top), found in Rhodesia, is more gorilla-like than the Neanderthal skulls, though resembling them in some respects. Certain of its features, however link it more closely with modern skulls, especially with those of the Australoid aborigines. Thus, Rhodesian Man may be a forebearer of the living Australian (bottom right).

Skulls by courtesy of British Museum, Natural History

Man), Eoanthropus (Piltdown Man), the Neanderthal type, the Rhodesian type and the Heidelberg type. No doubt scores of others will be added as deposits become more fully explored.

For the zoologist, every primate which holds its body upright, uses only its lower limbs for progression and has a brain which attains a certain volume—fixed provisionally at 950 cubic centimeters—is a member of the Human Family. Likewise the great anthropoid family includes very diverse members. Three of them are still living and can be studied, namely, the gorilla and chimpanzee of Africa and the orang of Borneo and Sumatra; we know of at least ten extinct forms.

No matter in what respect we compare Man, as represented by the Australian aboriginal, with any other living animal, whether it be in likeness of structural detail, habits of body, mode of life or in manifestation of feeling, the great anthropoid comes out as his nearest ally. Indeed, the two have so much in common that we must suppose, to account for the extent of their common inheritance, that they have arisen from the same ancestral stem.

Of all living great anthropoids the gorilla holds the highest place in the interest of the student of Man's evolution. He is the giant of anthropoids; he is the most massive and muscular of any ape known to us either in a living state or from the study of fossil remains. The fully grown male may weigh as much as thirty stones; the teeth, jaws, cranial crests and muscles of mastication of the male reach a point of development which leave the male orang far behind. Yet the gorilla brain, both in its mass and in its convolutionary pattern, marks the highest point in the anthropoid scale.

In its nature the gorilla is the most fierce, the most intractable and independent of all the anthropoids; even the young are morose, more difficult to tame and to teach than the chimpanzee, and rarely live long in confinement. Gorillas are gross feeders with large stomachs; their staple diet is the young shoots and leaves of bamboo bushes and such buds and fruits as may be in season. They are pure vegetarians. They live in the same part of Africa as the chimpanzee, but their area of distribution is not as wide. The total population of gorilla-land in all probability is under 5,000 and is fast dwindling.

In following out our present aim, which is to throw light on the origin of Man, the gorilla is of special interest to us because it possesses certain structural features which closely resemble those found in Man. It is clear that a weight of thirty stones handicaps an animal's agility and its power of climbing; a male gorilla would have difficulty in finding branches strong enough to carry him direct from tree to tree.

All recent travellers agree that the male gorilla, although he lives in countries densely covered by forest and jungle, rarely climbs; he is seen at his best when scurrying through thickets of bamboo. With his long, massive, strong arms he bends aside or breaks the stout bamboo stems, while he secures firm foothold by seizing the lower joints of the stem as he forces his way through dense masses of undergrowth. On open ground he supports the main weight of his body on his lower limbs and feet, the heels and soles of which are massive and wide; as he limps along he uses his arms as crutches with bent knuckles applied to the ground. His gait is clumsy and heavy.

When his wife and family, more facile climbers, retreat to the branches of a tree for rest or sleep, he seats himself at its foot, reclining against the trunk. Thus the male gorilla has taken to the ground, and leads just such a life as Darwin supposed Man's anthropoidal ancestor had adopted in his first steps towards the adoption of the upright posture.

When we examine the foot of a gorilla we find, in spite of the thumb-like great toe, that in shape and proportion it makes an approach to a Man's foot. Man has a special muscle for extending the first or basal joint of his thumb; this special muscle occasionally appears in the thumb of the gorilla, but has never been seen in any other primate. The nose of Man is one of his characteristic features—its prominence, and particularly the size of the wings which bound the nostrils. The gorilla's nose is also winged—much more so than is that of the chimpanzee or

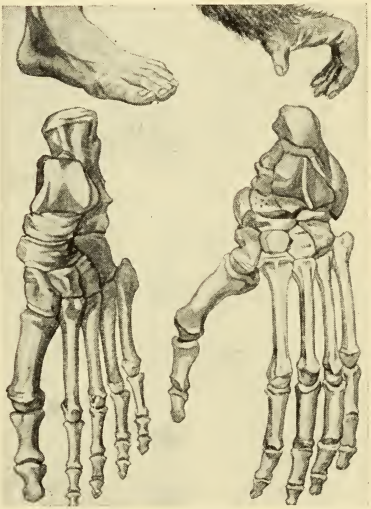
orang. The nasal bones of the orang and also of the chimpanzee have become greatly reduced, as in the Mongolian and Negro races of Mankind, but in the gorilla they are long and strong.

When we take into consideration the relatively large brain of the gorilla, the adaptation of its feet and legs to serve as the main support of the body, its tendency to abandon a strictly arboreal life and all the other human resemblances enumerated above, we are compelled to admit that the histories of this giant primate and of Man must have been closely linked together at some remote period.

In the structure of their bodies all the giant primates—Man, gorilla, chimpanzee and orang—have such an overwhelming series of structural features in common that we must suppose them to be the co-descendants of a common ancestry. The question thus comes to be: Which of the four surviving forms has retained most closely the characters, habits and posture of the common ancestor?

A survey of living human races leads us to conclude that the aborigines of Australia retain more of the common ancestral type than any other. An examination of the anatomy of living anthropoid apes elicits evidence which leads us to select the chimpanzee as the least changed of living forms. It is true, as we shall have reason to mention presently, that in certain respects, particularly as concerns characters of tooth and skull, the chimpanzee has altered during recent geological periods, but we may look on its posture of body, the proportions of its limbs, its mode of climbing and the general arrangement of its bones and muscles as very similar to those of that remote ancestor of which we are now in search. We need a name for this missing ancestor of the great anthropoids, and as zoologists at one time used the convenient though erroneous term Troglodytes, or cave dwellers, to designate the African anthropoids, we may speak of the first or earliest of the great anthropoids as Prototroglodytes. We know that in the middle Miocene times many forms of great anthropoids were in existence, especially those to which the name *Dryopithecus* (tree-ape) has been given; so we must infer that the Prototroglodyte ancestor had come into existence in an early phase of the Miocene, or even before then, in a late stage of the Oligocene period.

It may seem to the reader that we have now reached the beginning of Man's history and that it is unnecessary to proceed further.



FOOT OF MAN AND GORILLA

A human foot (left) and that of a gorilla (right) do not differ greatly in structure although externally not at all alike. The latter, with its short, easily movable, thumb-like great toe, has something of the appearance of a hand.

We have followed the anthropoid lineage back to a small orthograde primate, closer in structure to the living gibbon than to any other known primate. The nearest approach to such a type is made by Propliopithecus, found in Egyptian strata of early Oligocene age (see page 108). We know only the jaws and teeth of this small fossil ape; we do not know its habits of body, because we have found no limb bone to guide us. Here, however, where geological records fail us, the evidence of comparative anatomy comes to our aid.

When we contrast the structure of the gibbon with that of the monkeys of the Old World (the Catarrhine family) on the one hand and with that of the New World monkeys (the Platyrrhine family) on the other, we find that they have very many characters in common, and hence we must infer that all of them have arisen from a common stock—a small and primitive form of monkey. The posture of the body amongst the earliest known fossil primates was the pronograde or dog-like posture—still retained by ordinary monkeys. As this early monkey-like stock evolved and diverged there appeared in one branch a new mode of climbing—the vertical or orthograde mode.

Thus to obtain the beginnings of Man's posture we have had to trace the history of the higher primates back to earliest Eocene times—across a stretch of time which on the lowest scale of reckoning amounts to two or three millions of years.

Up to this point we have described Man's history as revealed from two sources—geology and comparative anatomy. We now turn to a third and even more important source of information, the developing body of the embryo.

In its earliest stages of development the human embryo passes through a series of peculiar and complex processes which culminate in the formation of the placenta—the structure which permits the embryo to draw its nourishment from the womb of the mother. Exactly the same processes are passed through by the early embryos of the anthropoid apes—both great and small. These changes occur only in Man and the anthropoids—the group of orthograde primates which, on the evidence of comparative anatomy and geology, we have traced back to a common Eocene ancestor. Thus, a study of human placentation, just as was the case with posture, reveals how closely the lineage of Man is bound up with that of the anthropoid ape.

The anthropoid womb is exactly of the same shape as the human organ. The embryos of monkeys, both those of the Old World and of the New, pass through early changes which, although similar in many ways to those seen in human and anthropoid embryos, are yet less specialized and more primitive. Even *Tarsius,* the sole surviving representative of the great family of Tarsioids—small, monkey-like primates which flourished in early Eocene times—is very similar to monkeys in the structure of its placenta. We thus realize how remote is the period which saw the first steps in the evolution of the human placenta.

All the orthograde primates—Man, gorilla, chimpanzee, orang and gibbon—are destitute of an external tail, but all of them possess a coccyx, which represents the submerged basal vertebrae of this organ. Every human embryo in the sixth week of development has a true external tail, made up of ten or twelve joints; in the seventh week the tail ceases to grow, and in the eighth week sinks into the rump, leaving at the point of submergence a dimple which can still be traced in every child at birth. Children are sometimes born with a tail, which may be four inches in length and may be used as an organ of expression when the child sucks.

The embryos of anthropoid apes also pass through a tailed stage. With the evolution of the orthograde posture which, as we have reason to believe, came into being in the Eocene period, the tail disappeared. The presence of an external tail in embryological stages of orthograde primates signifies that they have arisen from a pronograde or monkey-like ancestor.

In their earlier stages of development the brains of the higher primates—in which group Man is included—are very similar. Even as late as the fourth month of life within the womb, the human brain and that of the great anthropoids scarcely differ from each other in size and shape. In the later months of foetal life the same fissures and convolutions begin to appear in all of them, but while fissures and convolutions remain comparatively simple in the anthropoid brain, they become numerous and elaborate in Man's.

The volume of brain in a newly-born child is about 300 cubic centimeters; in the young of great anthropoids this varies from 200 to 250; in the gibbon baby the brain volume is only about 70 cubic centimeters. After birth the brain of the young gibbon increases gradually until

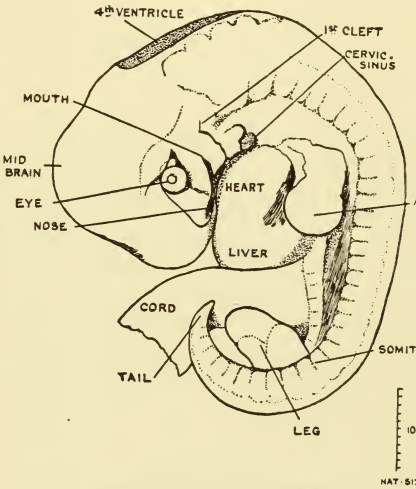
the animal is fully grown—a point reached in the seventh year—when the brain has attained about 100 cubic centimeters, thus having added 30 per cent to the volume present at birth. In great anthropoids the brain grows rapidly during its first year, attaining 70 per cent of its full volume. After that it grows slowly, having attained full size—about 450 cubic centimeters—in the tenth or eleventh year, when the animal has reached adult age.

In the human brain growth becomes intensified and prolonged. The first three years sees a child's brain expand from 300 to 1,000 cubic centimeters, an addition of 700; growth then slackens, the full size—1450-1500 cubic centimeters—being gradually reached about the twentieth year. The newly born anthropoid with a brain volume of 250 cubic centimeters has, at the end of the third year, an addition of only 100, as compared with the 700 added to a child's brain in a corresponding period. The facts elicited by this comparison will again bring home to the reader that the essential problem of Man's evolution lies in the secrets of brain growth.

If in recent geological periods the human body has ascended through a graduated series of forms to its present condition, why is it that we see no trace of these stages during the later months of its growth within the womb? We cannot say that in any particular month the human foetus resembles a monkey, then a small anthropoid and then a large anthropoid. Nor, if we go to earlier stages of development, can we recognize any which correspond to invertebrate, vertebrate, fish-like, reptilian or mammalian phases of evolution.

The human embryo does not recapitulate, in a clear and diagrammatic way, the chapters of its history. Nor need we wonder at this when we note how evolution works in human affairs. Between a city palace and a turf-roofed hovel every intermediate stage can be observed; the palace has evolved from the hovel. Yet when a builder begins to erect a palace should we not think him foolish were he to put up a hovel on the site and then proceed to enlarge it, stage by stage, until a palace finally emerged?

Yet amidst all the confusion in the developmental changes within the womb we can recognize definite traces of Man's evolutionary history. His body springs from a single cell; as that cell divides and re-divides until a cluster is formed, certain transformations take place which are almost identical with those seen in developing lower invertebrate animals.



TAILED STAGE OF MAN

From about the fourth to the sixth week of its development the human embryo has a prominent tail; this sketch shows it at six weeks. Then, in the normal course the rest of the body grows over it, and by about the eighth week it is completely enclosed.

From Sir A. Keith's 'Embryology and Morphology' (Edward Arnold)

In the second month of its formation the human embryo possesses a series of gill-like arches in its neck. The upper lip at the same period has a double cleft as in a dogfish; children who are born

with a double hare-lip thus reproduce a feature of a fish-like ancestor. Until it enters the third month a foetus has no palate or roof to its mouth. In this respect it is then like a reptile. Children born with a cleft palate retain a reptilian character. Scores of such instances could be cited. We cannot explain the elaborate processes of development which raise the human body from a single cell, unless we accept evolution as a truth; and yet there is no orderly recapitulation of evolutionary stages.

In 1904 Professor G. H. F. Nuttall, of Cambridge University, refined a method of determining the degree of relationship between animals in a new way, one founded on certain reactions given by blood. His observations confirmed the opinion which anatomists had formed concerning the exceedingly close evolutionary relationship between the great anthropoids and Man. Professor Nuttall found that the blood of great anthropoids gave almost the same reaction as that of Man, while the blood of Old World monkeys responded to a less degree, and that of New World monkeys still less.

The test of disease leads to a similar conclusion. Man is highly susceptible to the virus of syphilis; the chimpanzee is also susceptible, but to a lesser degree, while Old World monkeys are inoculated with difficulty. Anthropoids, like Man, have a vermiform appendix; when kept in captivity and fed on a human dietary the chimpanzee occasionally becomes the subject of appendicitis. When the evidence from all these lines of inquiry is taken into consideration the anatomist's verdict, that Man and ape are akin, cannot be denied.

In the various sections of this chapter evidence relating to Man's history has been drawn from three sources—from geology, comparative anatomy and embryology. In each case it has been necessary to begin with Man as he exists in the modern world, and then, by following his evolutionary trail, to carry history, stage upon stage, into a remote past. We have been reading Man's history backwards.

But now, having assembled our documents and established a scale of chronology—one which, we admit, is merely provisional—we may adopt the method of orthodox historians and trace Man's history down the stream of time. This can best be done by means of a diagram, such as is shown in the opposite page, which in reality represents Man's family tree. In that diagram the geological formations laid down in the Tertiary and Quaternary eras of the earth's history—Eocene, Oligocene, Miocene, Pliocene, Pleistocene and Recent—have been heaped one upon the other in order to form a chronological background; the depth or thickness given to each formation represents a relative estimate of the total time taken for its deposition.

Human history begins long before Man became a separate entity; it really takes its origin in the Eocene period, when a stock of small primitive monkeys, or Tarsioids, began to diverge into three groups. Two of these continued to evolve along quadrumanal or four-handed lines, retaining a pronograde posture of body, while the third evolved in a new direction, becoming adapted to an upright or orthograde posture. It is this early orthograde stock alone which concerns us.

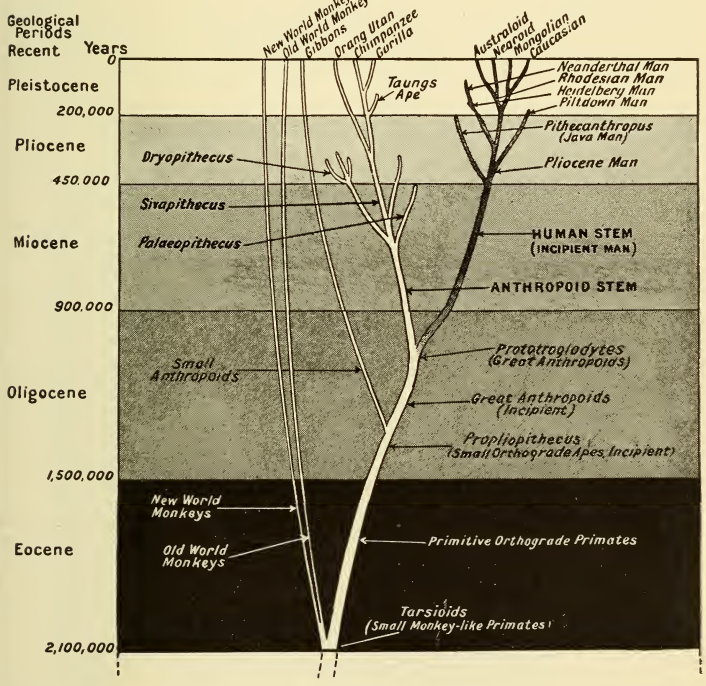
In the lower or older part of the Oligocene we meet with fossil remains of a member of this stock, *Propliopithecus*. Then from this point of time until the middle of the Miocene there is a great blank in our geological records, but from the evidence of comparative anatomy it is possible to sketch in the missing lines of descent. In the Oligocene period the early orthograde primates grew bigger in body and in brain, until they became, in these respects, almost equal to the small anthropoids of today—the gibbons.

Very soon in the Oligocene this small anthropoid stock again broke up; one branch retained the characters of the ancient stock, descending through the ages, altered only in a multitude of minor characters, and have become the gibbons of the modern world. Another branch of the small Oligocene anthropoids gained greatly in mass of body and size of brain, and thus the great anthropoid stock came into existence. The appearance of this new stock brings the historian appreciably nearer to his goal—the point at which Man's stock came by a separate existence.

For reasons already given, Man's origin has to be sought for in this early

great anthropoid stock, and the date of his emergence has to be assigned, on such evidence as is now available, to a late point in the Oligocene period, or even to the beginning of the Miocene. Fossil remains of great anthropoids become abundant in middle Miocene deposits; this ancient stock, greatly modified in detail, has come down to the present day in the form of gorillas, chimpanzees and orangs, while another branch, that which has given origin to the diverse family of Mankind, has, in the same period of time, undergone many profound evolutionary changes.

Between the end of the Oligocene period, where the emergence of Man from the great anthropoid stock is indicated, and the end of the Pliocene period, when the first sure trace of him occurs—the fossil remains of the Java type—our geological record is a complete blank, but

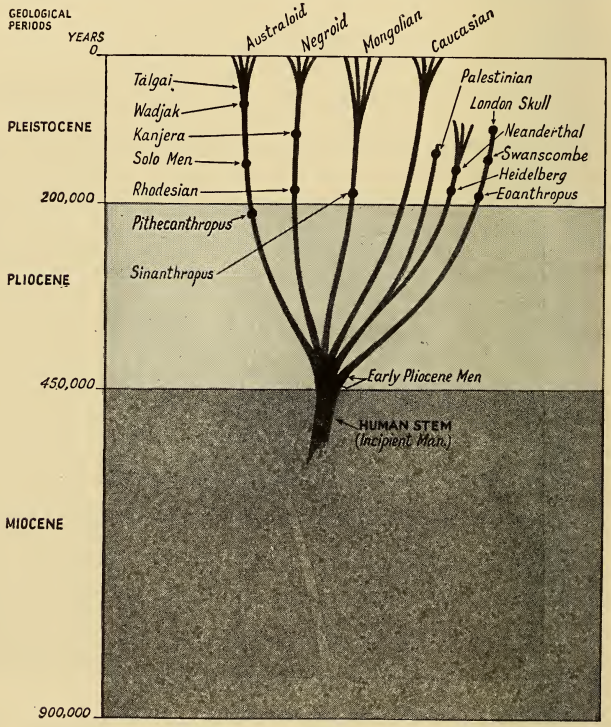


THE COMMON GENEALOGICAL TREE OF MAN, APES AND MONKEYS

This diagram, prepared by Sir Arthur Keith, gives us an idea of the ages during which Man has been evolving and of his lowly origin. It will be seen how early the branches of the apes and the monkeys, springing from a common trunk, became differentiated, and how the former in turn split into the anthropoid and the human stems. On Page 118 the human portion of the table is reconstructed to illustrate the theory of 'parallel evolution' as applied to the Australoid stock.

here again anatomical evidence comes to our assistance. Java Man has retained many marks of a simian origin, but his brain was on the threshold of humanity and he was altogether a man in posture and gait. Thus, although Man had apparently begun his emergence by the beginning of the Miocene period, it took him two long geological periods, 600,000 years or more, to reach a stage which may be called human only by courtesy.

The early stages in Man's evolution were slow and prolonged. Even when we enter the Pleistocene—the beginning of the human or Quarternary phase of the earth's history—we find that the human family, while broken up into such divergent types as are represented by Piltdown Man, Heidelberg Man and Neanderthal Man, retains primitive ape-like features throughout, although the brain had gained greatly in mass and in power. It is true that these have all become extinct and been replaced by



'PARALLEL EVOLUTION' OF HUMAN STOCKS

The theory of 'parallel evolution' seeks to account for the resemblances found to exist in the modern races of Mankind by suggesting that these races represent branches from the original human stem that have evolved independently. According to this theory Pithecanthropus and Sinanthropus have modern descendants.

After Sir Arthur Keith

human races of the modern or Neanthropic type.

Where the ancestry of modern races parted company from that of the extinct types just mentioned, we cannot yet tell; the degree of divergence between the Neanthropic races of Mankind inclines anthropologists to look for their common ancestral stock amongst early Pleistocene forms, but the only fossil type, so far discovered, which could have served as an ancestor is Rhodesian Man. We cannot place this type at a much earlier date than the middle of the Pleistocene period, and in size of brain and in massiveness of jaw and skull Rhodesian Man was more primitive—more gorilla-like—than the lowest of living human races.

So far the statements made here regarding the evolution of Man are based on well-established truths or represent opinions which are accepted by the majority of modern anthropologists. Those which I am now to make are novel, and are of the nature of reasoned suspicions rather than of demonstrated truths. The public which is interested in the problems of Man's evolution wants to know not only what is proved, but also the doubts which arise and the discrepancies which experts are meeting with and the directions in which solutions are being sought. It is for this reason I touch now on the problem of "parallel evolution," and the possible bearing of this theory of evolution on the construction of such a family tree as is reproduced in page 118.

What is meant by "parallel evolution?" Let us take a case which can be illustrated by the evolution of animals which are near akin to Man—the evolution of the monkeys of the Old World and of the New.

All land connections between Africa and South America have been broken since the Eocene period.

Monkeys had not yet come into existence when the separation of the two continents took place—only Tarsioids, diminutive in size and with relatively small brains, were then in existence. Yet after the separation of the continents the Tarsioid stocks so set apart developed in parallel directions, ultimately producing in both continents those forms of primates we name monkeys. Outwardly there is a degree of resemblance between certain monkeys of America and of Africa sufficient to induce the initiated into believing them to be near akin. Nay, inwardly the resemblances of the brains of the South American spider monkeys to those of their Old World evolutionary cousins are sufficient to impress even the expert. And yet the anatomist has no difficulty in distinguishing New World from Old World monkeys; certain structural details are always present in the one and always absent in the other.

We have, in the production of monkeys in the Old and in the New World from a common lower form—a Tarsioid ancestor—an illustration of parallel or independent evolution. Instances might be cited from other forms of life. No one did more than the late Professor H. Fairfield Osborn to establish the fact that parallel evolution has played a part in shaping the structural destinies of many mammalian stocks.

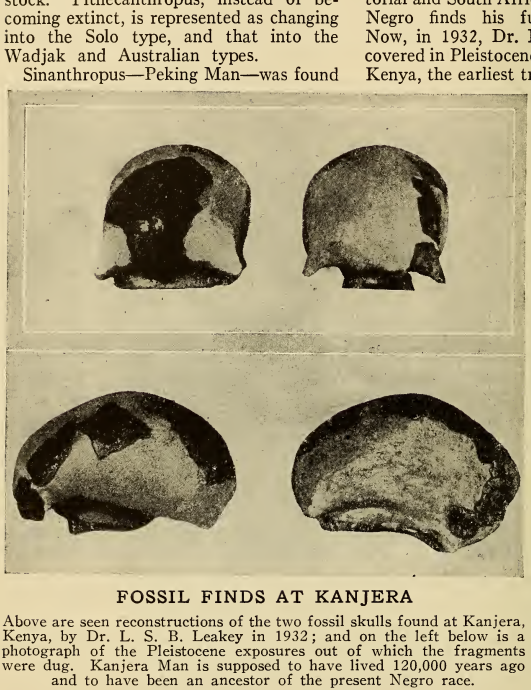
In the family tree, shown in page 117, the genealogy of existing races of Mankind—Australoid, Negroid, Mongolian and Caucasian—is represented as if parallel evolution had played no part in the characterization of modern races of Mankind. The resemblances of these races are explained as an inheritance from a common ancestor—the Neanthropic ancestor. This ancestor is depicted in the tree in page 117 as having been in existence at the beginning of the Pleistocene period. The progeny of this common ancestor of existing races is supposed to have spread into widely separated regions of the earth, and in these regions undergone differentiation into the four surviving stocks of Mankind. All other forms of humanity, save the progeny of the ancestral Neanthrope, are supposed to have died out. We must give Man's family tree some such form if we believe that races cannot have come by their modern characters independently.

Now let us accept the possibility of parallel evolution, and presume that existing races may have come by their outward and inward resemblances independently. Having accepted the possibility, let us apply the theory of parallel evolution to the evidence which recent discoveries have brought to light. In page 104 I have already cited the dis-

covery of fossil types which link Pithecanthropus to the aborigines of Australia. On page 118, the human part of the genealogical tree has been lifted from the figure on page 117 and reconstructed, to show a "parallel" derivation of the Australoid stock. Pithecanthropus, instead of becoming extinct, is represented as changing into the Solo type, and that into the Wadjak and Australian types.

Sinanthropus—Peking Man—was found in that part of Asia which has been the area of differentiation for the Mongolian stock; the site of discovery suggests Mongolian affinities. We have seen that, in his teeth, there are foreshadowings of peculiarities of the Mongolian dentition. Hence in the provisional tree I have treated Sinanthropus as an early Pleistocene ancestor of the Mongolian stock. If we refuse to accept parallel evolution as a working theory, then we must give Sinanthropus much the same position as has been assigned to Pithecanthropus in the original tree. If our supposition is true, then we should ultimately find fossil forms which will link the modern Mongol to Sinanthropus.

Let us now turn our attention to equatorial and South Africa. Here the modern Negro finds his fullest differentiation. Now, in 1932, Dr. L. S. B. Leakey discovered in Pleistocene deposits at Kanjera, Kenya, the earliest traces of Negro people known to us. The two Kanjera skulls are fragmentary, but they are sufficient to prove the existence of the most primitive Negroes yet discovered. Although the antiquity of the stratum from which these skulls came has been called in question, I, for one, am prepared to accept Dr. Leakey's statement —that they are from strata corresponding to the Chellean in Europe —giving them an antiquity of at least 120,000 years on the time scale which we are using. Further, in very early Pleistocene strata, also in the same locality as the primitive Negro skulls, he found a fragment of a lower jaw. The teeth are very primitive; the chin is beginning to form. The jaw shows no recognizable Negro feature, but it was found in the area of Negro differentiation. We have seen, too, that the Rhodesian skull is the only primitive specimen which could be modified by evolutionary change into a Neanthropic Man. It may represent a stage reached by the Negro stock early in the Pleistocene period. In the original genealogical tree (*see* page 117) Rhodesian Man is placed in the stem which led on to the Negroid and Austra-



FOSSIL FINDS AT KANJERA

Above are seen reconstructions of the two fossil skulls found at Kanjera, Kenya, by Dr. L. S. B. Leakey in 1932; and on the left below is a photograph of the Pleistocene exposures out of which the fragments were dug. Kanjera Man is supposed to have lived 120,000 years ago and to have been an ancestor of the present Negro race.

Top: Dr. Leakey's 'Adam's Ancestors' (Methuen); left, Dr. Leakey

loid stocks. In the provisional tree (*see* page 118) Rhodesian Man and Kanjera Man (the early Negro form discovered by Dr. Leakey) are placed in the stem leading on to the modern Negro races. If this provisional theory is well founded, then we should in the course of time discover a transitional form which will link Rhodesian Man to the Bushman, on the one hand, and to the Negro of the Gold Coast on the other.

Then there is the strange case of Piltdown Man—Eoanthropus. In the original tree he is depicted as breaking away from the main stem in Pliocene times and becoming extinct early in the Pleistocene. Two recent discoveries raised the suspicion that the Piltdown type did not become extinct, but went on evolving. In 1935 Mr. Alvan T. Marston, a dental surgeon, found in the 100-foot terrace of the Thames valley, at Swanscombe, a fossilized, primitive and peculiar bone of a human skull—occipital bone. It was embedded in Acheulean strata, which gives it an antiquity greater than that of any of the remains of Neanderthal Man so far discovered in Europe. Of all known types, it answers best to that of Piltdown. It is possible that the Piltdown and Swanscombe fossils are separated by a period of 50,000 years, or even double that amount. The two are separated by an interval of time sufficient for the production of evolutionary changes. Then there is another strange discovery which was made in the heart of the city of London in 1925. The foundations of Lloyd's were then being sunk into one of the ancient terraces of the Thames valley. At the base of the terrace was found the hinder part of a fossilized skull. It ought to have been of the Neanderthal type, for, so far as our knowledge goes, only that type of Man existed in Europe when the deeper part of the terrace was being deposited. It cannot be fitted into any Neanderthal cranial form known to us. It differs in detail from all Neanthropic skulls; its nearest affinity is found in the Piltdown type. Provisionally, it is permissible to give such suspicions a concrete representation, and this has been done in our tree in page 118.

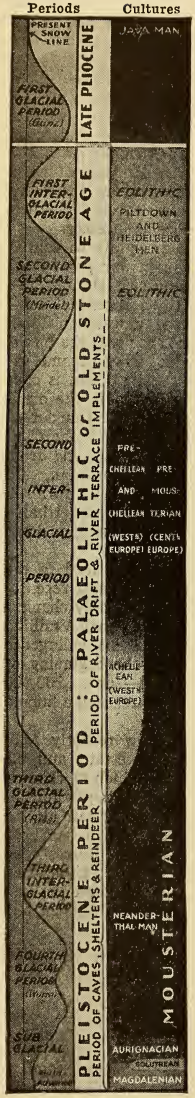
Thus three of the great stocks—Australoid, Negroid, Mongolian—are provided with lineages which separate in pre-Pleistocene times and have all undergone a similar kind of modification with the passage of time. The crudities of early Man have disappeared under the drive of developmental tendencies inherited from a common Pliocene ancestor.

Only one stock is now left without a definite representation in our provisional family tree—the Caucasian stock. The nearest approach to a possible mid-Pleistocene ancestor is Palestinian Man. Yet he bears too much towards the Neanderthal type, which certainly became extinct: so far as Neanderthal Man is concerned the delineation given in the original genealogical tree may be transferred to the provisional tree. In this the Caucasian stock is shown as springing from the same root as Palestinian Man, and Neanderthal Man for all three forms—Caucasian, Palestinian and Neanderthal—must ultimately merge in a common Pliocene ancestor.

Thus all lines of evidence lead to the conclusion that Man is the most recently evolved and the most profoundly changed of all living primates. Less than a million years have elapsed since his emergence began; it was not until the beginning of the Pleistocene period—some 200,000 years ago—that his brain reached a human level.

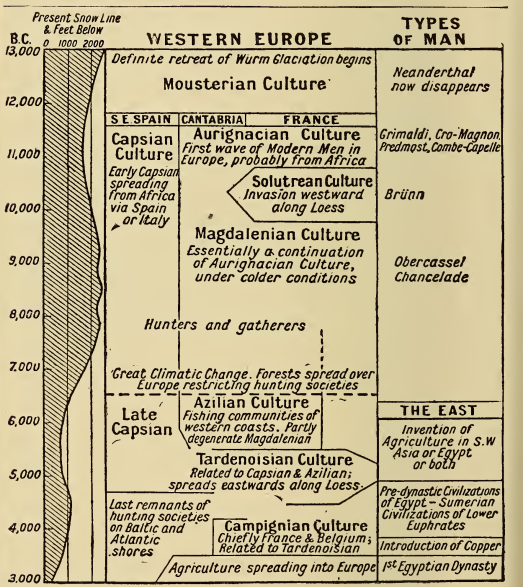
When we consider how recently Man has come by his present estate, and the ever-accelerating rate at which he changes his conditions of life, our hopes for his future are tempered by a certain degree of trepidation. Hitherto Man has been passive in the hands of forces and powers which shape his end; civilization is now reaching a point where he can no longer afford to be mere flotsam and jetsam on the sea of evolution.

Tables of Cultures



THE GREAT ICE AGE

The table at the left shows the geological and cultural divisions covering the Ice Age in Europe. The crowded period at the foot of the table is elucidated in the diagram below.



LATE STONE AGE RACES AND CULTURES

The table (at left) of Man's descent, which carries the human story back to pre-Chellean times, is too compressed to show in detail the cultures that multiplied towards the end of the Old Stone Age in Europe. The diagram above amplifies the table and carries it down to the beginnings of agriculture in Europe.

THE PRIMITIVE COMMUNITY AND ORIGINS OF RACES

WITH INFERENCES AS TO THE MANNERS AND CUSTOMS OF PREHISTORIC MAN FROM THE STUDY OF MODERN 'PRIMITIVES'

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THE old theory of the noble savage entering into a social contract is now as obsolete as that of a primeval communism. Society is part of Man's heritage from a pre-human ancestry, and it is within society that human individuality has grown up, providing a leaven of change which has vastly altered, but not constructed, society. Nor have forms of society arisen in each region simply in response to the conditions of life in that region; much depended on the vigor of the human types that reached the region in question, and perhaps still more upon the contacts of each society with others, and especially with those which first developed the great art of food production and its accompanying inventions.

The human baby is more helpless than his animal cousins, and remains so for a longer time, both because his head is bigger and he takes longer to learn to hold it up, and because his body has only downy hair and so is more delicate. Moreover, the erect posture was an acquisition of Early Man, and it involves training for every child. This implies longer and more intimate association between mother and child, and is, therefore, a stimulus to intercommunication and to development of language, besides giving increased opportunities for education.

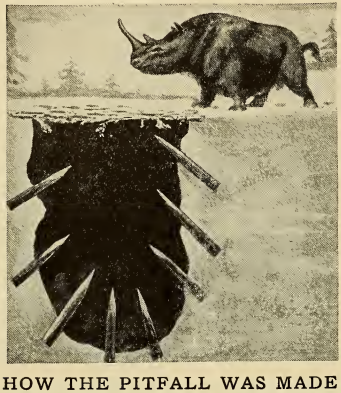
Whereas, in animal groups, the two sexes run together most of the time, in nearly all human societies women's work is differentiated from men's work. Man's animal relatives depend mainly on vegetable food, though they eat flesh on occasion. Man, on the other hand, has long depended largely on flesh and animal products; quite early in his history he became far more of a hunter than his ancestors, and this occurred while woman was becoming more of a nurse.

The data available for picturing the primitive communities of Mankind are very scanty, but we may make a rather speculative effort. No doubt, the first human groups were not very large, for concentration of population would bring risks of starvation among people as yet merely hunting and gathering. It is more than likely, therefore, that the young men and the older ones had many struggles. On the other hand, it is doubtful whether one man alone would be able to defend his mate, or mates, and children, or would have much success in making pitfalls for great beasts and driving them into the pitfalls; so a few would associate in a group and would attach to themselves a certain number of women and children. We have every reason to suspect that the aged, no longer able to hunt effectively, would get little consideration and might be abandoned or killed.

Although the group probably included a few men and some women and their children, it should not lightly be supposed that there must have been sexual promiscuity. However little paternity was understood, some sense of rights and privileges was almost certainly in men's minds, though it would be hazardous to say that either monogamy or polygyny was a general rule. Probably both occurred, and there may have been other schemes as well.

Men hunted, the women and the children gathered nuts and roots and berries and small animals; and we may imagine the tired and often unsuccessful hunters coming back to their womenfolk and

making the best of a meal of blackberries, or beetles, or mice, or perhaps tough roots hammered in water to make them a little less forbidding. Early Man was



HOW THE PITFALL WAS MADE

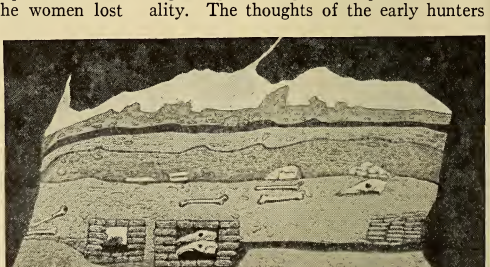
Palaeolithic hunters, we may assume, associated themselves into bands for the purpose of driving into pitfalls, such as this, the beasts that then roamed Europe. The pitfall, furnished with wooden stakes, has modern parallels in East Africa.

already, no doubt, a groundling, living on the grasslands, but probably not far from the forest edge; and though there must have been many groups that broke up because the men or the women lost their way, we can picture them calling to one another and acquiring the habit of making special sounds that became their personal names, or others that came to signify the food they had found or the dangers in the way. Their rudimentary languages must have been diverse and rather inconstant.

Somehow they learned about fire; very likely at first only how to enjoy it, then how to keep it going, and only after much experience how to make it. The first acquisition of fire is easy to imagine, as so many prairie and forest fires occur without Man's intervention. We may think of the women and children tending the fire and finding comfort therein, especially during the chill winters; and wherever their women waited with fire and some sort of food, thither the hunters would return sooner or later, with or without their booty. The fire was a social center, a promoter of intercourse and of language, a defense against wild beasts, and a help to the women in the rearing of their babies.

If the hunters had luck, there was work to do around the home-fire. One of the earliest uses of implements was probably for dealing with the produce of the chase, for skinning the big beasts, and most likely for chopping up their flesh, often eaten half raw, and more than usually tough if one was too hungry to wait till it was softened by turning "high." They had doubtless long appreciated stones as missiles to drive off wild beasts and rivals, and had learned what a sharp edge a fractured flint could have. Often the men, tired of the hunt, must have left the skinning to the women, who found the skins precious shelters for their babies and themselves from the cold night winds; and clothing grew in part from this experience.

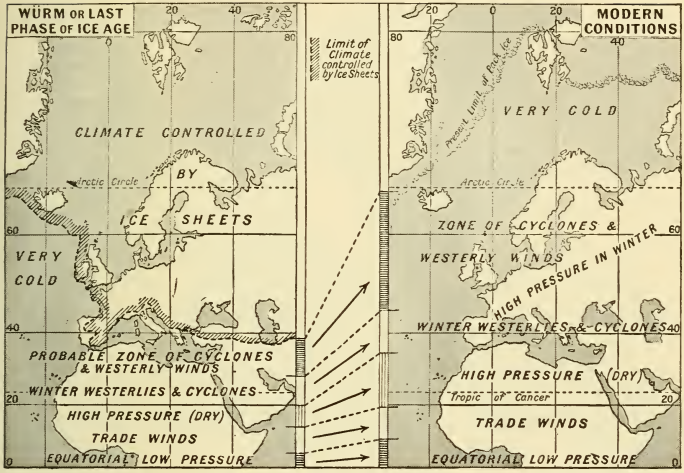
While our social group, then, largely followed immemorial custom, it was also beginning to enlarge the scope of individuality. The thoughts of the early hunters



BEAR-CULTS AMONG PRIMITIVE MEN?

This diagrammatic cross-section of the Drachenloch, a cave near the summit of the Drachenberg in St. Gallen, Switzerland, shows how Early Mousterian Man set aside the skulls of the cave-bear in neat stone cists, possibly for religious purposes.

After Bächler


WÜRM OR LAST PHASE OF ICE AGE
Limit of Climate controlled by Ice Sheets
MODERN CONDITIONS
CLIMATE CONTROLLED BY ICE SHEETS
VERY COLD
Arctic Circle
ZONE OF CYCLONES & WESTERLY WINDS
HIGH PRESSURE IN WINTER
WINTER WESTERLIES & CYCLONES
PROBABLE ZONE OF CYCLONES & WESTERLY WINDS
HIGH PRESSURE (DRY)
Tropic of Cancer
TRADE WINDS
EQUATORIAL LOW PRESSURE

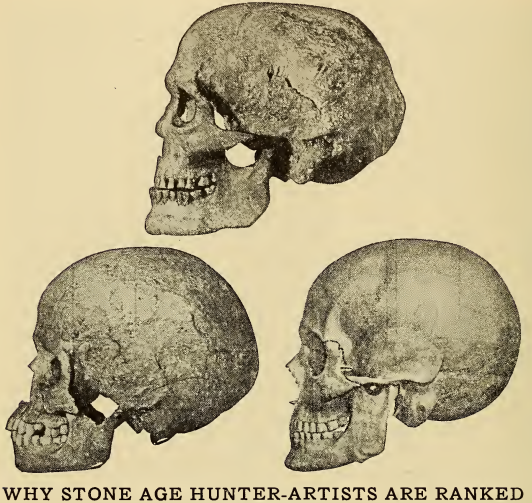
HOW THE RETREATING ICE ALTERED EUROPE'S CLIMATE

Some of the movements of prehistoric Man, as revealed by the remains of his cultures, have considerable light shed upon them by considerations of climate. Thus, during the last great advance of the ice, it is probable that North Africa and the Sahara enjoyed a type of climate which today we associate with central Europe, as shown by these two parallel maps designed by Prof. Fleure.

were turned towards the problem of securing prey, and from Switzerland and south Germany we have interesting evidence of the working of their minds on this subject in the days of the early Mousterian or pre-Mousterian culture, though we have as yet no indication of the types of men concerned. There, in certain caves, have been found regularly arranged skulls of the cave-bear, in some cases with one of the great limb bones near by. The indications are to the effect that the hunters cut off the bear's head and set it in a special place in the cave, and sometimes also set aside in this fashion a prime joint. In one instance these remains are arranged between the cave wall and a wall built of ordered stone blocks; in another, regular stone blocks are arranged to form a box or cist, with a lid of stone, to contain the remains. It is difficult to avoid the conclusion that these are offerings, analogous to what in later times would have been called first-fruits; so already in this very early stage of hunting society we are, as it were, on the threshold of religion.

Already in the Mousterian period ceremonial burial occurred among men of the Neanderthal race, and such burials became numerous in the succeeding, or Aurignacian, period among men of modern type, apparently very different from their predecessors in general civilization. Both cultures thus developed this idea, which some associate with the dawn of the dream of immortality, and which may at least indicate fancies about the magical powers of a leader continuing to exert themselves after his death. They also suggest that the glamour of leadership and power was already felt and that emulation, maybe, and the desire for social consideration were playing their part in some crude way as factors of social life.

What region our earliest forebears who could be called men inhabited is a subject of much discussion. Some students



WHY STONE AGE HUNTER-ARTISTS ARE RANKED AS MODERN

The new races that held the field in Europe after the disappearance of the Neanderthalers are considered to be modern men—that is, of the same species as ourselves; indeed, their traits may be recognized in some folk today. That there is no real difference between them and us is shown by these examples: Cro-Magnon (top) and negroid Grimaldi (lower left), compared with a modern skull.

From Dr. R. Verneau, 'Les Grottes de Grimaldi'

think that Central Asia before the great mountains arose was the scene of the beginnings of human evolution; but, however this may be, that part of the world was very inhospitable during the successive phases of the Ice Age, and it is with Man in the succession of ice ages and intermediate warmer phases, in the northern hemisphere of the Old World, that we are mainly concerned at the moment. During those intermediate phases men penetrated into western and central Europe; in the cold phases they seem to have inhabited western Asia, Africa and India.

The Neanderthal race apparently was capable of withstanding the last great phase of ice-spread in Europe, and the Abbé Breuil has suggested that it had lived through the previous glacial maximum as well.

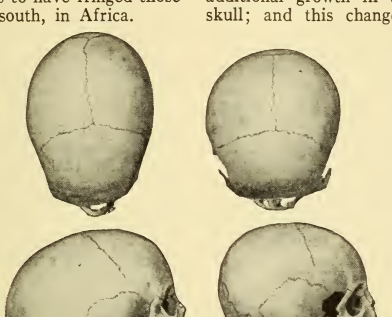
We do not know how it contrived to adapt itself or its equipment to the bitter cold, but, as its flint utensils were made from flakes chipped off blocks, whereas other races of that early time used chiefly the cores left after flakes had been chipped away, we must suppose that there were a good many differences in mode of life between that race and others.

Our bodies function best in a cool, temperate, variable climate with a good many storms and occasional, not too long, cold spells. Our minds are said to work best under cooler conditions still. It has thence been argued that the conditions which best suit us are those under which our ancestors became men of modern type, and that they gained an access of mental power in an age of cold. The argument is not a very strong one, but the conclusion is probable enough on other grounds, and it is, moreover, likely that those who had the initiative to cope with cold conditions, perhaps by means of fire and clothing, gained mentally thereby.

The last glacial maximum, called by Penck the Würm Ice Phase, began to pass away some fifteen or seventeen thousand years ago, though the retreat of the ice is thought to have been broken by considerable, if occasional, fresh advances during several thousands of years; the definitive retreat, broken only by short partial returns of cold, is provisionally datable a good deal less than 10,000 years ago. When the ice sheets in Europe and Central Asia were extensive, the belt over which the westerlies and their cyclones blew from the Atlantic lay correspond-

ingly farther south, and the Sahara and Arabia appear to have had winter rain and to have been grasslands. The desert belt, in parts, seems to have fringed those grasslands on the south, in Africa.

It is a useful provisional hypothesis that during this cold phase, on these grasslands lying between the Atlantic coast of the Sahara and the mountains of Persia, Modern Man came into existence, and that he spread thence. He could spread southward and south-eastward quite early; northward he would spread only as climate improved. His southward spread was, at first, through barren country, and was a route that the less fortunate alone would be likely to take. This is a fact that has a large bearing on the development of races and communities in Africa.



SKULLS LONG AND SHORT

Long-headed, or dolichocephalic, types (left) have the skull long from back to front, and rather narrow; while short-headed, or brachycephalic, types (right) compensate for the shortness of the skull by added breadth.

From drawings of fossil skulls by Dr. R. Verneau

So long as a large amount of ice remained in Europe, the severe climate seems to have kept the land fairly bare of trees. There were apparently great grassy expanses, and the winds from the ice sheets spread fine-grained material from the mud dropped by melting glaciers. This fine-grained material, carried southward by the wind, accumulated to form what is called "loess" along the northern foot of the hills of central Europe, as well as in a belt across Russia, in Turkistan and on the eastern side of the great central highland of Asia in what is now north China. This loess has played an enormous part in the latter growth of human societies.

Amelioration of climate brought a spring-time in human life, and it is from the Aurignacian period that we have the earliest indications of Modern Man.

Modern types of Man differ from ancient in the better development of the forebrain—expressing itself outwardly in additional growth in the length of the skull; and this change, associated with improvement of both eye and hand, culminated in the spread of Modern Man probably over what were then the grasslands between the Atlantic edge of the modern Sahara and the Persian mountain border of Mesopotamia.

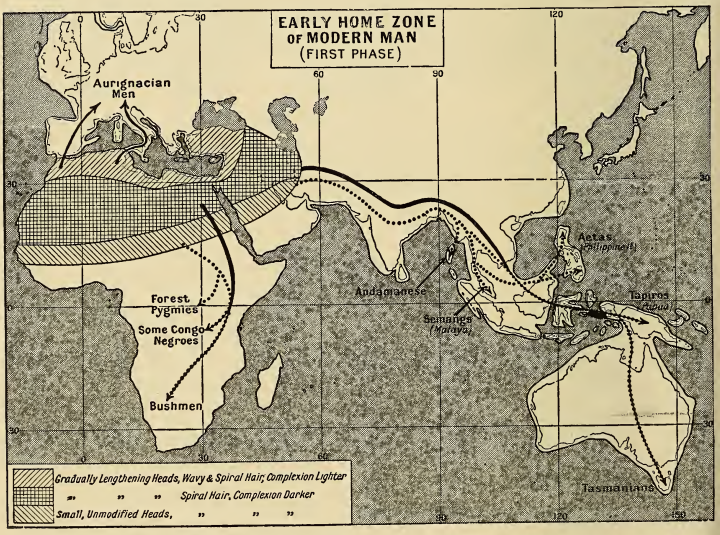
By way of hypothesis, it is useful to think of this change as occurring, with varying degrees of completeness, among the population of the grasslands mentioned, about the middle of the Old Stone Age or earlier. There were probably individuals, especially on the southern inhospitable desert fringe of the grasslands, in whom little or none of this extra lengthening occurred. They remained small-headed, and neither very long- nor very round-headed. We lack evidence as yet from early skulls for the ancient existence of this small-headed type of Modern Man, but there are small-headed types, generally known as the pygmy peoples, in the modern population of Africa and south-eastern Asia which have many indications that they are survivors of something very early in human development.

Of the remains so far discovered of people of that early period, most have been found in Europe and North Africa, and they show, typically, the lengthening of the head to which reference has been made. In some the nose was evidently broad and the nostrils were widely open; in others the nose was narrower and stood out more prominently. We know very

little of their hair, but one early statuette suggests spirally curved tufted hair, while one or two drawings suggest wavy hair like that of modern Europeans; probably both existed. The brains of these early modern men were already much superior to those of more ancient types, so far as they are known, and the earliest men of modern type that we know obviously lived a more varied life, with more initiative, than their predecessors. Evidently life was becoming tinged with deliberation and forethought.

The evidence of these people is mostly European, North African and south-west Asiatic; they probably spread to Europe from North Africa, but they may also have reached it from the south-east, via Russia or via the Balkans.

In our search for evidence concerning the earliest Modern Man, we have to infer what we can chiefly from burials, and the first point to be noticed is that no evidence of value has yet been found to suggest any cultivation of crops or herding of animals or making of pottery or grinding of stone. These arts, we shall find, develop later on; here we are concerned with people who still merely hunted and collected food, but who, nevertheless, stood far above the level of the Neanderthal types of Mankind. The burials show that social life had become richer than heretofore; thus there are instances of a man and woman buried together, of family and group burials, all made with care and, one might suggest, with reverent affection. The bodies



WHERE MODERN MAN PROBABLY ORIGINATED AND HOW HE SPREAD

It must be emphasized that this map and its successors are not intended to show what is known to have taken place; they represent a useful hypothesis in the present state of our knowledge. As the grip of the ice loosened on Europe, long-headed ancestors of modern men spread into it from the grasslands of Africa, while fringing groups with unmodified heads migrated southward and eastward. Relics of the latter probably remained in pygmy races of Africa and Australasia.

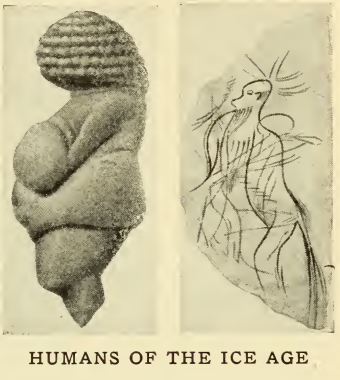
Maps of this and subsequent phases (pages 134 and 141) from material supplied by Prof. H. J. Fleure

were often decorated for burial, whether they were those of men or of women or of children, and the decorations include fillets and necklaces and pectorals of shells, fish bones, teeth and the like. Red ochre was often used to color corpses, probably to simulate blood, and their burials show that they had reflected on the importance of the head as the seat of intelligence.

Not only had they an idea of the importance of the head, but they knew something about the heart, as we may judge from the red heart painted on a mammoth outline, and the painting of arrows (some red) aimed at the heart region of a bison. One is tempted to think that they had meditated on the seat of the springs of life and mind, but whether they had speculated on the origins of the world or of Man we have as yet no idea. Unless the burials found are all burials of leader-families, which seems improbable, we have no clear indications of a leader-class with special insignia or other marks of privilege, and it is likely that the people of the first dawn of European civilization lived in groups not very distinct from the family.

A subject of very great importance to Mankind is that of the growth of population. There seem to have been several occasions on which great spurts occurred —that due to the development of steam machinery and transport is fast weakening at the present time; that apparently connected with the large-scale organization of government and communications, culminating in Imperial Rome, was a previous phase; that probably linked with the spread of the horse preceded this by rather more than two millennia; while that associated with the first rise of food production was about two or two-and-a-half millennia earlier still. The bettering of climate after the Great Ice Age must have been an important factor in this increase, and it may be dated a few millennia before the invention of food production.

The loess-dwellers of that time and some of the cave-dwellers of France show by the details of their well-known statuettes that the reproductive function of women was a matter of great moment to them, and that some recognition of it was a very vital feature of their social life. That it was closely related to the beginnings of religion is suggested by Australian and other lowly folk of our own time.



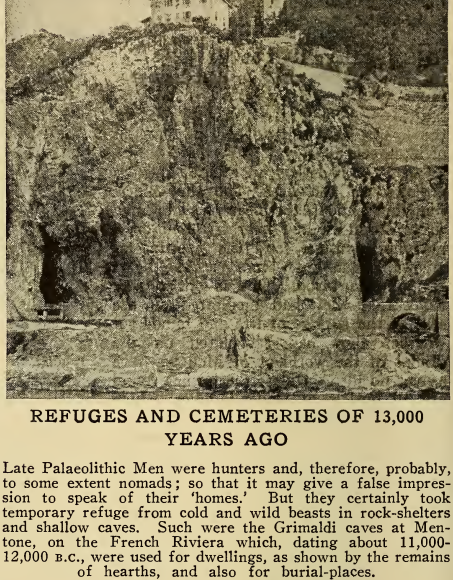
HUMANS OF THE ICE AGE

Among the early hunter-artists there was a marked tendency to emphasize female characteristics, as may be seen from the statuette found at Willendorf in Austria (left). Such representations of immensely corpulent and steatopygous women may indicate the prevailing type of beauty, or the figurines may have been fertility charms. The 'Sorcerer' (right) is in the Grotte de Lourdes.

The hunter-artists made a great speciality of the decoration of chambers, deep in dark caves, with pictures or, in some cases, relief-models in clay of animals, and we cannot but associate this decoration with some form of ceremonial, perhaps conducted to bring the hunters luck. Bison are the commonest animals, but there are also deer, reindeer, wild boars, goats, mammoths, rhinoceroses, horses and fish; and there is strong temptation to think that the hunting was collective or co-operative, and that the groups gathered in the deep caves, either to beg for luck from the great hunters of the past or, more probably, to try to get luck through some kind of magic.

Footprints upon the floors of the caves still remain to tell of long-forgotten rites. The painted caves also lead one to think that the hunter-artists had fairly permanent centers, and their habitation and burial caves suggest long residence, so homes and fires were doubtless a feature of social life.

Moreover, their tools clearly tell us of thought devoted to securing success in hunting. Many of them are small flints; and different workshops—perhaps of somewhat different dates, perhaps contemporaneous in some cases—followed different types of technique. There were fashions in those days, and tools were clearly adapted deliberately to different purposes, to scraping and piercing, boring, cutting, engraving, or etching, sawing, smoothing a wooden stick, straightening an arrow shaft, and so on. The large numbers of little flint-points sometimes found suggest workshops and perhaps the carrying of spare parts by these old hunters—who seem to have had the notion of fixing flint on wooden shafts, an important invention. They were also taking note of the possibilities of bone, which could be rubbed to make spear heads, harpoons or needles, while hollow bones were sometimes used as paint boxes, to contain the red ochre they used so much. Ivory was also valued and worked for implements and ornaments. Stones were used as paint palettes.



REFUGES AND CEMETERIES OF 13,000 YEARS AGO

Late Palaeolithic Men were hunters and, therefore, probably, to some extent nomads; so that it may give a false impression to speak of their 'homes.' But they certainly took temporary refuge from cold and wild beasts in rock-shelters and shallow caves. Such were the Grimaldi caves at Mentone, on the French Riviera which, dating about 11,000-12,000 B.C., were used for dwellings, as shown by the remains of hearths, and also for burial-places.

From 'Les Grottes de Grimaldi'

Some burials have remains of leather aprons, so the hunters had clothing; even the children seem to have been clothed. This suggests that the bone-needles were used for sewing, and, therefore, sinews were probably used for threads. We have no evidence of weaving or of felting, but animal hair found in certain burials suggests that the latter art may have been practised.

Why in certain regions there are no paintings of the human figure comparable in value with those of animals we can hardly guess. One may recall the fact that Islam to this day, like Judaism before it, rigidly objects to representations of the human figure, and it is quite possible that this prohibition is an inheritance from days long before the concept of the unity of God as a spirit had come into men's minds.

Considerable attention has also been devoted to impressions of hands with mutilated fingers on cave walls, since this custom of mutilating a finger, as a token of grief or for some other social reason, is widespread, even if often in make-believe fashion.

Rather different in some ways was the more or less contemporaneous civilization in eastern Spain. Here a great feature was the making of drawings, not in caves, but on rock surfaces. Here, too, the aim of the artist was not the fine, sometimes polychrome delineation that the artists farther north strove to obtain, but rather schematization of outline and the depiction of scenes showing human beings. The drawings are full of the suggestion of movement.

The human figures are conventionalized in various ways, and in the end the con-

WHERE CRAFTSMEN OF THE STONE AGE LIVED AND WORKED

Very different from the normal refuges of the hunter-artists were the caverns where they executed their masterpieces of animal delineation. These were tortuous passages carved by water-action out of limestone bluffs, and in their dark recesses were probably enacted strange scenes of magic ritual for ensuring prey. Note the wall paintings in this chamber of the Niaux cave in the Dordogne.

ventions become extremely simplified. The men are naked, the women wear skirts and some kind of sleeved shoulder wrap. They are often in groups, and in one instance a group of women is shown around one man. Whether this has relation to marriage schemes or not we can hardly say, though it is probable. The paintings of eastern Spain show men fighting one another and hunting with bows and arrows, and there is no longer any doubt that these were in use in the days of the hunter-artists; indeed, it may well have been the invention of the bow that increased their power and numbers and so made life richer and more varied.

About the middle of the long period during which the hunter-artists lived in western Europe people came westward along the loess and brought with them a wonderful technical skill in flint chipping, as shown in the fine "laurel-leaf" implements known from the station of this age at Solutré in Burgundy as Solutrean. They appear to have been horse-hunters, and their culture penetrated to south-western France, and even to northern Spain; but it died away again, and the continuation of the older Aurignacian civilization which then developed is called Magdalenian.

There can be little doubt that we have amongst us survivals not only of the people of the age of hunter-artists—some of their types are fairly clear in modern populations—but also of their ideas and customs. We must not imagine them to have been very different from ourselves in their little weaknesses, however much they differed from us in their expression of their feelings and thoughts about the world. There is no ground for ascribing to them any special form of social organization such as the primeval communism that has sometimes been imagined. No doubt most members of society then, as now, dropped naturally enough into their places in the group and accepted the duty of labor with those little slacknesses and evasions that kept society from fossilization.

Sollas and others have drawn special attention to the parallels between the hunter-artists of old Europe and the Bushmen of South Africa. There is doubtless a good deal in this idea, provided that we do not identify too closely the ancient population of Europe with the modern one of south-west Africa. Both belong to early varieties of Modern Man, so they have points of resemblance; but these are not full enough to enable us to speak of Bushmen in ancient Europe. The Bushmen make rock drawings not without resemblance to the ancient ones of eastern Spain, and the fact that tale-telling is another of their arts may be said to allow the guess that our hunter forefathers in Palaeolithic Europe had begun to tell tales around the social fire, though not yet, as we shall see, to recite legends about heroes of the past and their exploits.

Apparently the societies of the hunter-artists of ancient Europe left little of

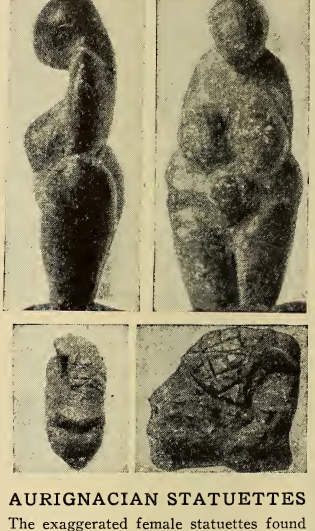
ANATOMY IN ART

We may infer that the hunter-artists knew their anatomy from the drawing of an elephant in the Spanish cave of Pindal, with a heart indicated over the correct region, and of a bison in the Niaux cave with arrows pointing to the heart.

From Capitan and Breuil, 'La Caverne de Font de Gaume'

their inheritance to later times, and when we study modern groups which are dependent on hunting, we find that all are in great difficulty owing to inability to face modern civilization. These old-fashioned societies are fading away, while many of the societies of lowly food cultivators are maintaining, and in some cases increasing, their numbers, despite dangers due to contacts with the white man. The invention of food production and allied arts made a vast difference to Man, and gave increased permanence and organization to his societies. Larger numbers were able to live side by side with some sort of order. Diseases took their toll, no doubt, but residues survived and populations acquired a measure of resistance.

Exchanges multiplied and languages apparently acquired more widespread resemblances. The smaller societies of the hunting phase, in their relations with food-producers, lack the underlying "common measure" of mental processes that helps the lowly cultivator to face even modern Europe; they lack the adaptability shown by the lowly cultivators when they continue their gardening and get food for themselves even if European intrusion disintegrates their social order.



AURIGNACIAN STATUETTES

The exaggerated female statuettes found on Aurignacian sites may have been made by a negroid folk subject to steatopygy (over-development of the thighs) like the Bushmen. More probably they had a ritual meaning. These steatite figures and heads are from the Grimaldi caves at Mentone, on the French Riviera.

Photos by courtesy of M. Salomon Reinach

Usually the hunting societies lack any well-developed system of writing or records, almost always they lack genealogies, and with this goes the absence of legendary tales of heroes, at least legends of any fullness. As a rule they have ideas of sympathetic magic—that is, they believe that they can influence an object, such as their prey, by influencing its simulacrum, a painting or a model, or something that is associated with that object, such as the teeth. It is quite

possible that utilitarian magic of this kind was one of the main factors of the ancient art of the early hunters, but we should not exclude the play of fancy and the pleasure a carver might get from shaping some design on his weapon, while perhaps he was spending hours waiting and watching for prey. It is interesting that already among the old hunter-artists we find instances of the use of concentric circles and of spirals as decorations.

Nowadays, hunting societies are usually without marked class distinctions, and this may perhaps be taken to suggest that class distinctions did not develop far among the old hunter-artists. In particular, there are no very regularly recognized chiefs or priestly orders, though wizards or magicians are usually found, and we have already seen reason to think that they functioned among the early hunters. Priests in the fuller sense are an accompaniment of a more established tradition.

Reference has been made to the careful burials of the Palaeolithic peoples and to the possibility that they had some dream of spirit-survival. It is quite likely that they wished to propitiate a dead person lest he should return as a harmful ghost. Skeletons have been found in positions which suggest they were securely tied down, while others were carefully covered with heavy stones. On the other hand, we may well have indications of affection or reverence in ancient burials. Burials seem to have been made in several cases within the habitation, and possibly the habitation may have been abandoned, perhaps closed up as well, during putrefaction. There was quite possibly some idea of protecting the bodies from wild carnivores.

There seem to be no indications of funeral feasts, and only doubtful and rare hints of ceremonial connected with the bones of the dead. Women were often buried at least as carefully as men, and nothing can be inferred concerning sacrifices of widows or slaves at the grave, such as have occurred in several regions in later times.

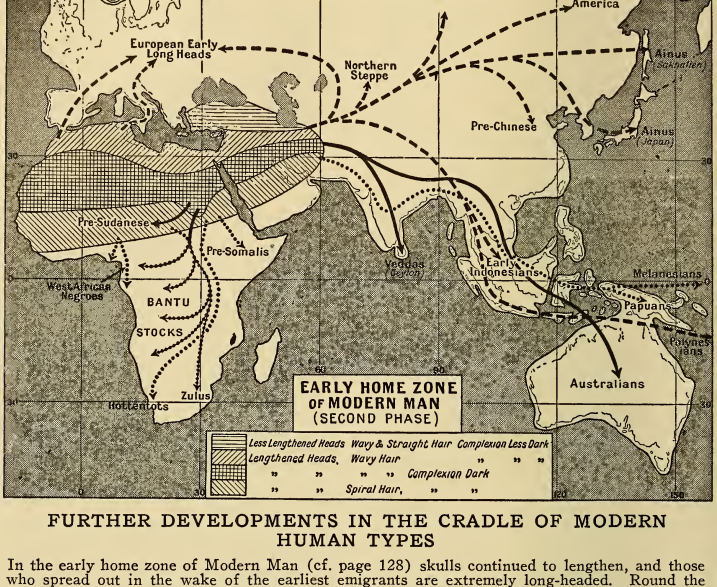
It is quite probable that the experience of dreams very early led Man to the conclusion that his spirit or "ego" was distinct from his body and could wander off in sleep, even to the realms of the dead, with whom converse might be held. This, or even more rudimentary forms of what later became religion, is all that we have any right to think was practised by the old hunter-artists. But their fine physique, their artistic powers and their evident, if temporary, triumphs over difficulties leave a tantalizing doubt as to whether their religious interests were not more developed. We cannot doubt that they realized the social value of ceremonial; but we have no ground to assume that they had a true priesthood.

With this summary in our minds, and remembering that analogies between ancient hunter-artists and recent hunting people may be quite partial only, we may proceed to think of the crisis that blighted hunter-artist life in Europe, a crisis strikingly different from that, due to contacts with cultivators and industrialists, which has blighted the few remaining

SORCERER IN ANIMAL GUISE

Rare though the human figure is in the more northerly cave culture (except for female statuettes and reliefs), we do find paintings of men in disguise. These were probably magicians, the dress being a form of game-stalking device, as in this painting in the Trois Frères Cave, near St. Girons in the Pyrenees.

Courtesy of Mr. M. C. Burkitt



FURTHER DEVELOPMENTS IN THE CRADLE OF MODERN HUMAN TYPES

In the early home zone of Modern Man (cf. page 128) skulls continued to lengthen, and those who spread out in the wake of the earliest emigrants are extremely long-headed. Round the fringes of the zone—for instance in Anatolia—the lengthening was probably less marked. Note that here, as in the previous map, the hundred-fathom mark is taken as representing the then existing shore-line.

societies of hunting peoples that still linger in our world. The crisis followed the retreat of the ice sheets and the accompanying sinking of land around the coasts of Europe. The belts of climate shifted northwards toward their present positions, and forest, at first largely pine, spread over what had been cold, grassy plains. The big beasts of the older time retreated from the now wet, forested lands, and in Europe these yielded few, if any, food plants that could have been cultivated even if the human societies of the time had proved able to take up the art of cultivation. The evidence points to the decline of society and the arts, and to survivals of impoverished food-gatherers in various situations such as along seashores and river banks, where shell-fish and the like provided food.

Very serious indeed was the crisis for even at the present day the regions of cold, coniferous forests are in many cases considered too poor to cultivate. It is true that, in western and even north-western Europe, the pine forest was succeeded and squeezed out by the deciduous temperate forest as climate further improved, and deciduous forest land, if the soil is reasonably good and fairly deep, is generally worth clearing for cultivation. But, even if there had been food plants at hand, it is doubtful whether the hunter-artists would have invented cultivation. They had gone through a phase of depression, they had retreated before the earlier phase of the crisis, and it appears to be enormously difficult for a society that has retreated to brace itself for a fresh advance on new and untried paths. So western Europe hung back in the cycles of change and became for a while a mere barbaric fringe, barely in cultural

contact with peoples who were advancing elsewhere.

After the passing of the Ice Age a great local burst of invention and social organization changed human society in lands of the eastern Mediterranean and south-western Asia. Often it used to be said that hunting society gave way to herding, and that progress was through herding to cultivation; but this is increasingly doubtful. Food production through cultivation seems to have been the central invention of the great social revolution, but it was accompanied by many another invention, and a well-known scholar has remarked that all the fundamental inventions had been made by the end of the Ice Age or soon afterwards, our later inventions on this view being only extensions of great principles then discovered and applied.

Cereals are the most widespread among the cultivated plants, and of these wheat and barley seem to be the oldest still in use. The ancestry of wheat is not well known; it is a hybrid, and some ancestral plants seem to have belonged to south-western Asia, somewhere around what Breasted has called the Fertile Crescent ringing the Arabian Desert on the north. Wild barley is native to south-western Asia and north-eastern Africa. The art of cultivation arose in some part or parts of this region. As the climatic belts shifted northwards to their present positions, an orderly succession of seasons established itself, with rain in winter and rivers filled by melting snow in spring, and with a hot summer following thereafter. Such a regular succession of seasons encouraged cultivation once it had begun, but as to its beginning we have, as yet, practically no evidence. We may fancy that in the valleys among the hills the women looking about for food would clear with stone picks space for the freer growth of plants which they knew would later yield them grain. From some such beginning, or from the happy consequences of leaving an offering of wild grain with the body of a dead tribesman, cultivation could take its rise. It has often been suggested that the spring sacrifice (once human, later animal) to secure fertility of crops points to the latter origin. Both are suggestions.

Now, the use of a chipped stone for digging would smooth the edges, and could lead the user to see that stone tools might be shaped by grinding. Stones other than flint lend themselves to grinding, so that men were freed from their earlier main dependence on flint, and this was an important gain, especially for the peoples of the valleys in regions of old rock, where flint is very scarce or absent. The typical ground stone axe is a useful hoe and a fairly good wedge, and it can split wood as no chipped flint could. A new command over wood gave increased possibilities of hafting, of leverage, of making stone-armed, wood-handled diggers, of building dwellings and palisades near plots of grain. Definitive and durable settlement was thus promoted, in order to guard crops and to enjoy a dwelling and the protection of a palisade, and we may be sure that numerous houses were gathered together for defence.

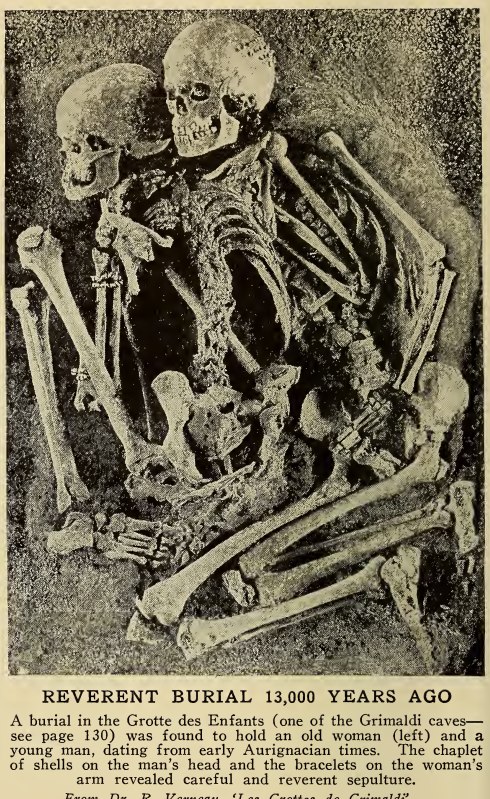
The mound at Susa gives evidence of a grain-cultivating community, at first without domestic animals, but with ground stone axes and a considerable and concentrated population. It also has pottery, and that is another of the associated inventions that may have arisen in one of many ways. Once invented, it gave new possibilities of storage, of mixture, of food preparation, of softening grain for the baby, as well as of fermenting it to get exaltation for the adult into realms of magic and passion.

In addition, there are copper objects, and this tells, if possible, an even more important tale. Once flint was no longer the mainstay of the tool-making industries of most regions—in other words, once stone-grinding had been learned—all sorts of hard stones seem to have been sought and tested. Prospecting journeys began on an enlarged scale, and stones were tested, among other ways, with fire. The finding of copper, which could be shaped by hammering and could be softened by heat so as to be cast in a mould, was a matter of immense interest, though the copper tool was too soft to replace the stone one for many purposes.

Without further trespass on the subject of primitive crafts, it is now possible to sum up and to suggest that human societies some time after the effective end of the great Ice Age, probably some-

where in south-western Asia, developed a complex of inventions including cultivation, stone-grinding, the wedge and lever, improved wood-work, pottery and the beginnings of metallurgy. The beginnings of domestication of animals followed these inventions very quickly; a palisade and stakes and cords could hold a captured calf till it was wanted for food, and might bring the mother-cow under control and lead to her becoming a source of milk for the children. The domestication of cow, sheep, ass and dog, at least, occurred fairly early along with these great inventions, and it is possible that other steps forward were also made, one being the invention of the wheel.

All these inventions made possible the rise of much denser centers of population than the world had previously known; population underwent a great expansion. That this increase in numbers, and the accompanying increase in complexity of labor and of leadership, led to great developments of social organization seems beyond doubt, and we have endless indications of this from Mesopotamia itself.



REVERENT BURIAL 13,000 YEARS AGO

A burial in the Grotte des Enfants (one of the Grimaldi caves—see page 130) was found to hold an old woman (left) and a young man, dating from early Aurignacian times. The chaplet of shells on the man's head and the bracelets on the woman's arm revealed careful and reverent sepulture.

From Dr. R. Verneau, 'Les Grottes de Grimaldi'

The early cultivators in lower Mesopotamia lived in communities probably larger and more compact than those of any hunting peoples; they were mostly placed on defensible mounds near rivers, lagoons or the sea-coast; the people seem to have cultivated the edge of the river plains, doubtless with the help of the fertilizing silt deposited by periodic floods when the snow melted on the mountain sides. In this lowland there were many river channels that could be cleared and even extended at need, and it is probable that men learned here to manage water, to bring it to their crops, to drain away excess. Irrigation is very old, and the need of many hands for this work was one of the factors promoting the increase of the size of communities.

Both digging the soil and digging the irrigation canals were hard work, and needed skilled direction by careful observers. The plants cultivated included wheat and barley, with the important

supplement of the date palm. The Garden of Eden story suggests a primary dependence on fruit and subsequent condemnation to hard labor for food from the herbs of the field; and this is a likely story of the change from food-gathering, in a region of date palms and other fruit trees, to food production by cultivation. The communities obviously controlled their cultivated land, and we hear of many fights that had their origins in quarrels about boundaries, quarrels that could arise only too easily on a flood-plain with shifting sands and streams.

Now, if the early cultivators inherited animistic beliefs—ideas of the existence of sources of energy connected with, yet distinct from, their bodies and other objects—we can understand the development of these ideas and of the social position of the magicians. Their life was becoming regulated in a more intimate fashion than of old, their link with their environment was becoming more complex, and their powers over that environment more marked and more direct. Especially on the flood-plains there was scope for the one-time magician to acquire real skill in foretelling times and seasons, to the great advantage of the cultivator; and the moon became an object of special study, for obvious reasons.

Settled in one place, as it now was, gaining immensely from following a wise counsel, and urgently needing a military leader to organize protection against enemies who could play havoc now that cultivation was the support of life—the community naturally developed leaders. These might be primarily kings, who might also perform rites to secure fertility of soil or beast, and so could be king-priests, perhaps like Melchizedek; or they might be primarily priests who ruled as well as performed rites and kept the traditional lore in their memories. Among leaders there was no doubt the anxiety for posthumous fame, and with a priesthood learned in many spheres there was the opportunity of treasuring genealogies with legends of heroes interpolated in them, as in the case of Nimrod. So folk-tale became supplemented by genealogy, often orally communicated, and then genealogy by heroic legend. Writing was a further step, though there are a good many instances in which an oral tradition has been held to be far more sacred than the written one.

Accumulation of traditional lore was clearly supplemented quite early by attempts at scientific observation, and in these cases a priestly class appears to have grown apart from the royal class and in many instances in conflict with it. The ziggurats, or towers, of early Sumerian cities seem to express the social importance of a class of observers, no doubt of priestly rank. The story of the tower of Babel, it may be, tells of one specially great tower for whose building there were gathered together men of diverse tongues; the results were disastrous. A great development of communal expression with, later on, palaces and temples, kings and priests thus follows the rise of the art of cultivation and the attendant concentration of people into groups.

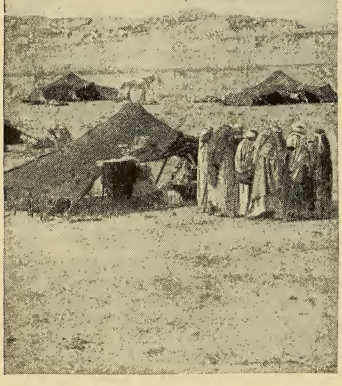
From a vague animism thought progressed to naturism, with the idea of a moon spirit, a corn spirit, a river spirit, a sea spirit, and so on, and also to the worship of the hero, king or priest, dead or living. The ideas no doubt intertwined; ruling families mingled them in their genealogies and gained the prestige derived from superhuman ancestry. The idea of a mother-goddess, probably derived from the Stone Age, was another important one. Hierarchies of gods later developed towards the idea of a god of the whole earth.

Visitors to the desert border know how often the boundary of the cultivable land is a sharp line; it is a case of "everything shall live whither the water cometh." On the one side of the line may be irrigated gardens; on the other poor, rough pasture with many thorns fades only too quickly into sheer desert. The early cultivators of Mesopotamia had rough pasture and desert flanking their cities, and the story of Cain and Abel illustrates the difficult relations between the cultivators of the cities and the herdsmen of the desert border.

We have seen that domestication of animals in south-western Asia is probably not quite so old as the beginning of cultivation. Domestic animals were undoubtedly kept by the cultivators as

far as opportunity allowed, but the people who lived on the rough desert border were forced to depend mainly on animals. In south-western Asia there were at first sheep, goats, asses and cattle; the camel and the horse were later acquisitions, the latter from the north-east.

Now, whereas the cultivator with some domestic animals can live completely on his own produce, with cereals, dates, milk products and some flesh food, it is hard for large groups of herdsmen of cattle, sheep and goats to thrive solely on animal food, even though they may supplement it by dates from the patches of palm trees which often occur on the desert edge. The herdsman of the desert border is thus drawn into relations with the cultivator, whose grain he may raid or, on occasion, even buy. He does not do much cultivation himself, and his group is necessarily smaller, more mobile and less attached to one spot than is that of the cultivator.



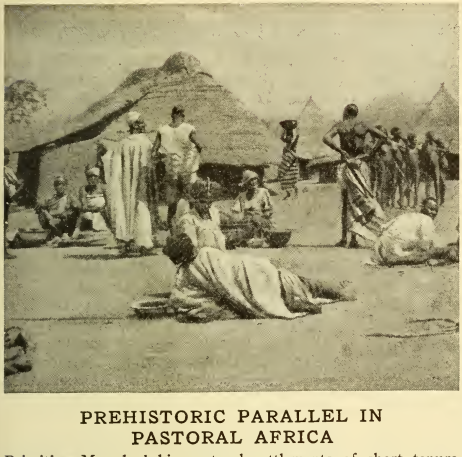
HERDSMEN RIVALS OF THE MEN OF THE TOWNS

The hard life of the herdsman on the border between the 'desert and the sown' breathes from this photograph of a beduin encampment amid the Saharan wastes that stretch south from the skirts of Biskra. The pastoral group is a family one, its members having in theory a common descent; its ruler is a patriarch, and his followers haughty warriors who despise the menial city-dwellers.

Still, it has its territorial ideas, and these express themselves, in a dry land, as claims to springs and wells of water. Its leader is less hedged around with majesty than the ruler of the city; he is, or has been in younger life, foremost in the endurance that is one of the most necessary qualities of the herdsman; he gathers experience and becomes the fountain of good counsel, and so tends to combine in himself the functions of leader and of priest, as the stories of Genesis suggest. The herdsmen's leader lives among his people, and a group of his wives and children may often become a large enough unit for practical purposes; too numerous a group may need herds so large as to tax water supply and pasture, as we know from the account of the separation of Abraham and Lot.

Hence the herdsman group of the desert border is, typically, a large family group, consisting, at least in theory, of the descendants of a patriarch. The herdsmen must watch and bring back straying animals, must defend their herds against wild beasts and cattle-thieves, must be ever ready for feats of endurance. The need for this readiness on the part of the men has put upon the women a number of heavy duties, such as the making, building and moving of tents, the making of clothes, the preparation of food and drink, as well as the care of children.

The herding group of the desert border is, typically, a tribe gathered around a patriarch who may have old and tried helpers as stewards. The tribe, at least in theory, is of one blood, its property is mobile, it is always ready for war, it protects its members as far as possible by the threat of the blood feud, requiring an eye for an eye and a life for a life—probably a life for an eye, too, on many occasions. The herding life is one of endurance rather than of menial toil, and the herdsman is a haughty fighter, proud of his genealogy, and apt to despise the cultivator working at the soil with his back bent, rarely free to roam, often unskilled in war and lacking in endurance of its hard conditions.



PREHISTORIC PARALLEL IN PASTORAL AFRICA

Primitive Man had his pastoral settlements of short tenure. Similarly, in intertropical Africa most villages are so impermanent that they hardly deserve the name. The soil is quickly impoverished and the settlements soon become uninhabitable by reason of accumulated refuse, so that it is imperative to move to another site. Only the partly pastoral communities, as on the Nigerian grasslands, build settlements as permanent as that seen here.

Photo, W. S. Boreham

It is difficult to add many new items to the material equipment of the Arab herdsman without limiting his mobility, though some such introduced items, for example the camel and the horse, have increased that mobility very notably. Apart from such special innovations, however, these herdsmen are very conservative, and this has increased the gap in thought between them and the men of the cities in times of city prosperity.

Consequently, in the early stages of food production in south-western Asia we have two types of early society arising side by side, and, naming them from their later, well-developed forms, we may call them the city and the tribe. The mental outlooks of the two societies were deeply contrasted; the city society was based on neighborhood with kinship as a subordinate idea, the tribe on kinship modified by adoption and other fictions. In the city writing, contract and legalism developed; in the tribe the spoken word, the oath of allegiance, the blood feud became outstanding.

Architecture, engineering, metallurgy and the potter's art became as characteristic of the city as leather work, mastery of animals and organized mobility were of the tribe. In the city economic factors exerted vast influence; in the tribe immemorial custom interwoven with religious practice dominated life. The city was apt to entertain foreigners and to fuse originally alien elements into its life; the tribe, for all its rules of hospitality, was at heart exclusive.

And these two groups were forced into relations with one another from earliest times. The tribesman saw the cultivators as a source of plunder, or he might earn from them a tribute of grain or of metal by vouchsafing the protection of his mobile force. The citizen, with his limited space, was no doubt glad to buy the surplus animals of the tribesmen, especially as some domestic beasts, notably the camel when it was utilized, were liable to degenerate in conditions of riverine life. The tribesman, apt to organize and command and hardened to war, could look down into the feuds of the town and see an opportunity of taking command and of making the citizens do the menial work for him.

From time immemorial it has thus happened that tillers have been dominated by herders, who have married their maidens and so have gradually fused into the civic group, to be conquered in turn by new tribal incursions founding new dynasties doomed to vanish after some ten or twelve generations. From time immemorial, also, the mobile tribesmen have exchanged goods from city to city.

Cultivation and herding arose in south-western Asia or north-east Africa, but possibly herding also arose, on somewhat different lines, in the grasslands of Asia

farther north. From one side or the other from the west or the south-east, or both, we may think of hunters and gatherers spreading into the Asiatic grasslands east of the Caspian, rich in wild herds of sheep, cattle, asses and goats, and also of camels and horses, the two animals destined to play a great part in later social evolution. Gradually the men of these grasslands commanded the camel and ultimately the horse, and with these admirable carriers they enormously increased their range of movement and their power over their herds. Moreover, mare's milk is a peculiarly valuable food.

In studying both the early home zone of Modern Man and the west Asiatic grasslands we must remember that with the final stages of the retreat of the ice-sheets their climate, like that of Europe, changed, but changed in a different direction. In Europe a forest, first of pine and then of oak, spread over what had been cold grassland, the climate becoming softer. In the supposed early home zone, and in the great grasslands, the rain-bearing winds penetrated less and less and the desert spread. Doubtless the desert spread quickly in the Sahara, and fairly quickly in Arabia, though the latter was largely highland between the Mediterranean and Arabian Seas, and may have continued to receive some rain for a considerable time. It spread less quickly in the Trans-Caspian region of western Asia, where there were immense stores of water from melting snow and ice on the surrounding mountain ranges; but towards the beginning of the Christian era these stores diminished rapidly, and even before that occasional successions of bad seasons must have led the grasslanders to push their way out because of the threat of famine.

The drying of the Sahara and Arabia, too, was a powerful incentive to the development of riverine life with its schemes of food production, concentration of population and irrigation near Euphrates and Nile, and the general drying helped to push men out and to spread the arts.

·How have human communities developed under the influence of the inventions and drifts of the food-producers?

Pressed upon by later migrants, the earliest out-wanderers from the home zone have found refuges either in the far corners of the earth or in unfavorable environments. They still live for the most part by hunting and gathering, but in many cases their social organization shows the influence upon them of the food-growers. Survivors of these earliest out-wanderers are the pygmies of south-eastern Asia and its archipelago and of equatorial Africa, the Bushmen of south-west Africa, the Australians and the inhabitants of various far corners in America; though in the last case we must be careful not to suppose that they are a race distinct from the other Americans —they are merely the earliest, and so the farthest spread, of a series of waves.

Coming next to Africa, we find that the great mass of African societies has passed into the phase of food production —in some cases with the emphasis more on cultivation, in others more on herding. Neither sheep, nor ass, nor horse, nor camel is at home in intertropical Africa, and cattle, poultry and goats are thus the chief domestic animals, though sheep of a kind are kept in some parts. The people grow millets and various other rather inferior grains; manioc and maize have reached Africa since the discovery of America by Europeans, and most African cultivated food plants have come in from outside. Communal hunting of buffalo and elephant is often carried on.

Climates in intertropical Africa are one and all rather trying to the human frame. In spite of his moist, supple, hairless skin, often richly supplied with blood-vessels, in spite of the large open nose and the everted lips, the widely and loosely open sweat pores and many other details, it is difficult for the native to get rid of enough heat to allow him to develop high initiative.

We must picture people, then, working under heavy disadvantages, acquiring fragments of the arts and social ideas of the food-producers of Mesopotamia and the Nile, and acquiring them mainly via the Nile.

It is a melancholy fact that one of the most general features of human society is the exploitation of the under-dog, and nowhere has that been more marked than in Africa, where conquest has again and again forced people to do the hard work

of cultivation for others who formed a military aristocracy, though, in inter-tropical Africa, society has not developed sufficient means of organization and expression to give great permanence to established dominion.

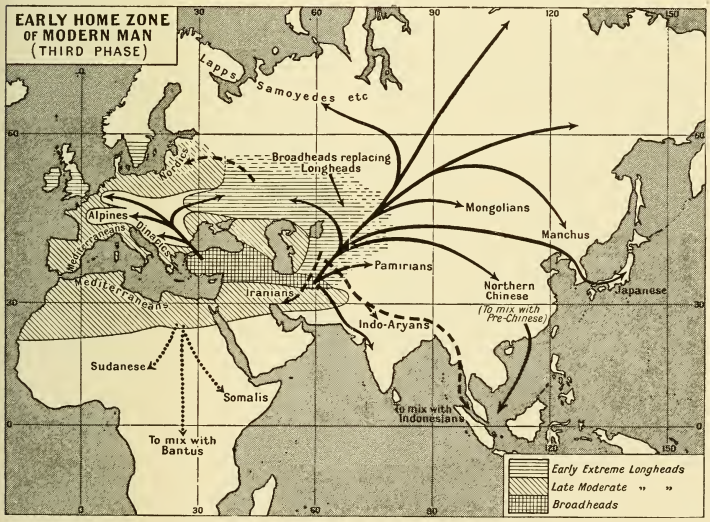
Insect-borne diseases affecting cattle are rampant, especially in forest areas which can be cleared for cultivation, and large-scale organizations of combined herding and planting are not common.

In some regions, after a few years' residence in a village on a cleared patch, the factors above-mentioned make the village deteriorate, so another patch is cleared and a fresh village is built and the cycle starts once more. It is probable that this state of affairs occurred also in Europe in the early days of cultivation.

Towards the northern tropic villages are larger and more permanent, and herding societies have more of a patriarchal or regnal organization. Some places have huts for over two hundred thousand people gathered together, including what might be called temples and palaces; but these developments and any other germs of the city are generally to be ascribed to the influence of fairly recent invaders from farther north. Africa south of the Sahara is practically without the idea of the city, in purely native life.

In far-off times the full apparatus of the early food-producers reached India and many villages and cities grew up; it has been said that there are 750,000 villages in India today. The village traditionally held and used its lands, often under a local leader and largely managed its own affairs and local rites in honor of its own deities.

In the third millennium B.C. cities developed at any rate on the Indus, and



HOW THE HIGHLANDS OF THE WORLD WERE COLONIZED

After the early, extremely long-headed people had made themselves characteristic of as much of Europe as was suitable for their hunting mode of life, they were gradually superseded by agriculturists and forest-dwellers whose diet permitted a less exaggerated lengthening of the skull. The extremely broad-headed folk seem to have been uplanders who spread east and west from the mountain knot of Anatolia (see solid black arrows), colonizing the hitherto unpopulated highlands.

these had some kind of relation with Mesopotamia. Aryan speech may have come later on in two waves: the second was a movement of conquest in the later half of the second millennium B.C., and the horsed conquerors were able to maintain their distinctive life in the north-west, though their sacrifices of cattle had to be restricted because they angered the common people to whom cattle were sacred. The diversity of peoples, modes of life and traditions persisting in India has had much to do with the development of the caste system.

Turning to China, we find again indications of an advance of food-producers, with most of the accompanying cultural heritage, through the interior of Asia, at a date which is far from certain but was probably in the third millennium before Christ, while movements of cultivators also occurred in eastern Asia which are not yet very clear. The first-named advance apparently took place chiefly through Kansu and the Wei-ho valley along belts of loess, which gave an inexhaustible supply of fertilizer, down to the flood plain of the Hwang-ho with its rich mud derived ultimately from denudation of the loess.

Here, once the Wei-ho was reached, conditions enforced cultivation rather than herding as the basis of life; the conquerors from the interior had to devote themselves to the organization of terracing and irrigation—had to become administrators—and so were not able to maintain their distinctness to anything like the extent which seems to have been possible in India. The weakness of the caste distinctions in China is as characteristic as their strength in India.

Among the Chinese cultivators, using terracing and irrigation, co-operation of a certain number of workers seems to have been found generally desirable, and the group based on kinship maintained itself. Thus the "large household" became the typical unit, involving co-operation, community of property and the duty of mutual protection.

The growth of large cities, with expressions of corporate life in architecture and the arts is a great feature of the food-producing civilization in its adaptation to China. Another feature is the marked subordination of stock-rearing to cultivation, a fact not unrelated to the crowding of population and to the general tendency to pacific endurance rather than warlike adventure. The deep difference between digging in North China and under torrid conditions in India should be noted. Density of settlement and continuity of hard work has led men's thoughts towards problems of practical conduct, and it is these problems that have specially occupied the great minds of China.

Attention might also be given to communities in America, Japan, south-eastern Asia, Melanesia and Polynesia, but it is advisable to turn rather to Europe. We left, in a earlier part of this chapter, the communities of western and north-western Europe suffering depression and poverty under the influence of the spread of inhospitable pine forests after the final retreat of the ice. It is true that forests of ash and oak and beech succeeded the earlier ones of pine, and that the climate of the temperate forest of deciduous trees is the one which best suits humanity; but, for all this, Europe did not find herself able to develop of herself a great civilization.

Suggestions have been put forward that the peoples around the south and western sides of the Baltic Sea made a fresh start and were responsible for many developments, but investigation tends to suggest that the real spurt came from south-western Asia in the third millennium B.C., however early that new dawn may have affected the Baltic, which became a center of attraction because of its amber. Childe, in "The Dawn of European Civilization," has shown what a great part the loess soils of the Danubian region played in the awakening of Europe to food production, but at the same time trade was spreading in the Mediterranean basin and Crete and Troy were rising into prominence.

The difficulties in the development of food-producing groups in Europe north of the Mediterranean were many. The climate was less regular than in south-western Asia; forest, except on loess and limestone, was dense and difficult to clear; soils, except parts of the loess, were much more liable to exhaustion than those fertilized by river silt of Euphrates and Nile, and the cereals needed time to acclimatize

themselves and to develop races of grain suited to European conditions; and, finally, deeper ploughing than on Euphrates and Nile banks was found necessary for success. For much more than 2,000 years after the introduction of cultivation, the food-producers of Europe north of the Mediterranean did not rise above the level of village communities.

There is little doubt that conquerors from the edge of the steppe repeatedly influenced these village cultivators of ancient Europe and contributed to their organization, and in this connection it should be remembered that the horse, and its association with the king, is a feature of early Teutonic thought, as it is of early Indo-Aryan and Iranian thought as well.

An attempt has now been made to suggest what can be inferred concerning early human communities of hunters and food-gatherers, and then to picture the social changes following the grouped inventions which seem to have accompanied the rise of the great arts of food production. Some degree of penetration of food-producing organization and inventions has affected almost every community on earth, and some of the ideas involved have grafted themselves on to older ones in Africa and even in Australia, Melanesia and elsewhere. The organizations based on food production have come to fullest fruition in Europe and Asia, and have expressed themselves less completely in Africa.

We can say fairly safely that, especially among small and isolated groups—in Australia, Melanesia and Polynesia, for example—there has been much loss of introduced arts, or else that fragments of them survive only in half-understood forms. The danger of ideas and arts dying out among isolated communities is widespread, for in such groups habit tends to harden into a rigid rule, which decays bit by bit as its meaning becomes less clear. Intercourse, on the other hand, has often been a quickener of thought and a help to the maintenance of meaning in social custom; it has meant contact with other minds and other ways, the growth of powers of observation, and of an objective view of one's own life and group. It was intercourse that finally wakened Europe from its sleep of decay after the impoverishment of the early hunter-artists, and this intercourse, linking it especially with the steppes, south-western Asia and the Mediterranean, pressed life forward step by step, till Rome spread the idea of the city as far as the Rhine.

So we may venture the generalization that, while society in any region is in some measure an adjustment of relations between groups of men and external conditions, yet in almost all cases, almost everywhere, it is impossible to give an adequate interpretation of a society on these lines. There must be drawn into the discussion the immense factor of intercourse, of the direct and indirect influences of human contacts. Sometimes these are so discordant with the indigenous cultures as to cause their decay, but they may be fruitful both in their immediate contributions to social equipment and even more as stimulating progress, however slow, towards the distant goal of liberty of conscience.

PRIMITIVE CRAFTS IN PEACE AND WAR

THE MATERIAL EVIDENCE THAT SURVIVES TO SHED LIGHT ON THE ART ADROITNESS AND DAILY LIFE OF PREHISTORIC MAN

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MAN is the manipulative animal; he owes his supreme position among living creatures to his handiness. As for the tool, it may be regarded generically as an extension of the hand. Handling things thus by deputy, Man, in the course of a long process of experiment, has discovered how vastly to increase the range of his manipulative activity; so that the mechanical achievements of modern civilization seem at first sight out of all relation to their far-off humble beginnings.

Nevertheless, the study of the origins of our present immensely complex arts and crafts not only reveals the strictest continuity between them and their savage prototypes, but likewise proves that the early chapters of the romance of industry can bear equal testimony with the later to the inventive genius of our race.

Now, prehistory starts from a blank. When Man first comes into view he is already in possession of a material culture implying, on the evolutionary hypothesis, a lengthy process of previous development. Probability alone can guide us in reconstructing the tool-using efforts of fossil Man's unknown precursors. A few animals, and notably the apes, which in point of physical resemblance are nearest to Man, are said occasionally to fling a stone or brandish a stick when in a state of Nature, and during captivity can be taught to display such accomplishments in much greater variety; though it remains doubtful how far in the one case or in the other such acts involve any full awareness of the function of the means employed.

If, then, we credit Man or his prehuman ancestor, despite his opposable thumb and his relatively bigger brain, with an initial technical ability on a par with an ape's, we might label it the appreciative stage; since the user of the casual stick or stone at least appreciates it as somehow satisfying to his present mood. From this basis a rising scale can be constructed consisting of successive stages which may be called the selective, the adaptive and the inventive.

Thus, first, there is advance as soon as, in place of the first thing to hand, a natural object is picked out as especially suitable for a given purpose. Moreover, such a tendency must soon lead to the collection and storing of a supply of ready-made appliances of the type preferred. Next follows the adaptive stage, when it is realized that what does not wholly conform to the required pattern may, nevertheless, be made to do so by subjecting it to more or less modification.

The artificial tool now makes its appearance; and it is to be noticed that there arises herewith the need for tools that will help to fashion more tools—for a hammer-stone to chip a flint knife, a flint knife to carve a wooden club, and so on.

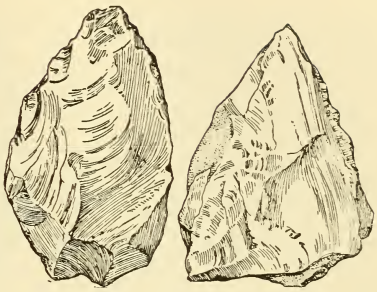
Finally, the inventive stage differs from the adaptive only in the degree in which Nature's provision becomes subordinate to Man's design—in other words, comes into being at whatever point the suggestion of the form can no longer be said to be given with the matter. Of course, Man cannot create out of nothing, and the intrinsic qualities of the material thus always, in a sense, predetermine the use to which it is put.

Passing on to a survey of the actual evidence, we clearly cannot expect many recognizable traces to be left of the appreciative or the purely selective stage. If sufficiently durable, the things doubtless survive; but how is one going to distinguish them? At most one can hope to judge by marks of use, as contrasted with those marks of design which are exhibited by the product of adaptation or invention.

So—more especially if they are associated with worked implements—one can pick out the natural pebbles used as hammer-stones by the abrasions visible on their striking surfaces; or may, less certainly, argue that other pebbles found in a little heap near a hearth and showing signs of having been subjected to considerable heat were cooking-stones. Or, again, I have discovered in a cave habitation of Preglacial Man pieces of rock crystal, jasper and so on, of remarkable appearance, that were, presumably, brought there because they somehow appealed to the fancy of their finders.

Meanwhile, the supreme test of the former presence of Prehistoric Man—apart from his bones, which are comparatively rare—is the evidence of workmanship. Unfortunately, at the very beginning of the adaptive stage the genuine artifact is exceedingly apt to be confused with the "pseudomorph," Nature's counterfeit, which sometimes reproduces the appearance of human fabrication with almost irresistible plausibility. Hence the vehemence of the controversy about eoliths.

Further, a question which arises as soon as their human source has been proved—namely, what special purposes they are intended to serve—has hardly been touched. A few of them might, perhaps, appear suitable for cutting, piercing and so on, in a rough way, but for the most part they consist, as Professor Sollas once put it, of "scrapers that will not scrape, borers that will not bore, and planes that will not plane." Quite without prejudice, then, to the question of the value of such evidence as proving the existence of Tertiary Man, one may say that it throws no light at all on the state of his culture.



FLINTS SHAPED BY EARLY MAN

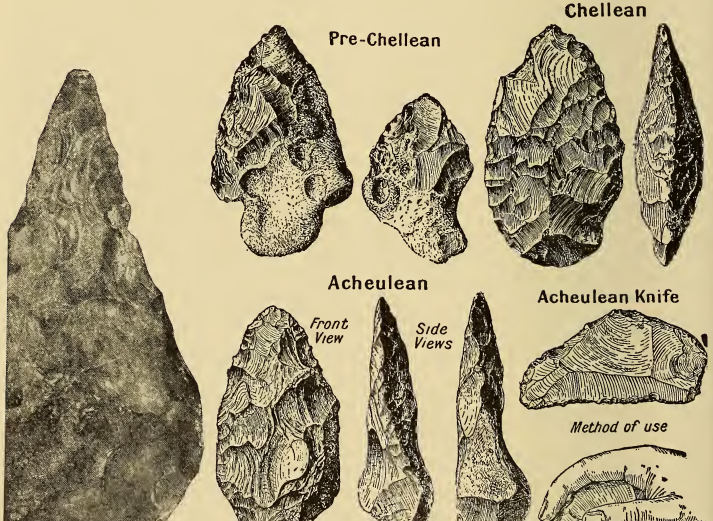
Piltdown Man could probably manufacture articles from flint as well as from bone, since near the skull were found apparently contemporaneous flint implements, coarsely flaked and very unshapely, like those shown in the drawing above.

In the Lower Palaeolithic industries, pre-Chellean, Chellean and Acheulean, the typical implement is the so-called "coup-de-poing" ("boucher," knuckle-duster and hand-axe are other terms), though sites of this age in reality yield a fair variety of other forms. Meanwhile, the coup-de-poing itself varies greatly in the course of its development, the outline being triangular, pointed, lozenge-shaped, oval or even round, while the line of the edge, at first irregular, becomes, as time goes on, either quite straight or gracefully sinuous.

Produced out of a flint nodule or other lump of stone, by chipping both sides until a sharp working edge results at one end and a butt comfortable for grasping at the other, this fine instrument presupposes a long apprenticeship in the art of reducing crude matter to a desired shape; such, indeed, as is scarcely reflected in our existing Palaeolithic series of types, however much we draw on the Eolithic series to help it out. A possible inference is that the adaptive stage was inaugurated by an age of wood, the output of which has perished. Indeed, it is in any case necessary to suppose that wooden clubs, spears and so forth were in use side by side with the coup-de-poing, which is usually thought to have served more as a "general utility" tool than as a weapon of offense, as the word "coup-de-poing" would suggest.

Meanwhile, whatever its function, this form of stone implement appears to have come into universal favor, so that it would even seem that in the Acheulean, as compared with the preceding Chellean period, there was greater concentration on this single type. Whether such implements were ever hafted is uncertain, and the term "hand-axe" is not used here because it begs this question. It is extremely probable, however, that the inventive stage of uniting stone and wood in one composite tool had not yet dawned for the man of the Lower Palaeolithic.

With the Middle Palaeolithic begins the cave period, and at once we are on intimate terms with Man, being able to visit him at home, where the floor, carpeted with refuse, proves his shelter to have been also both kitchen and workshop, nay, sometimes even his place of burial as well. Brutish though Neanderthal Man was in physical appearance, he must have been intelligent in his own way. In one cave of this period which I excavated I found that, of about 15,000 pieces of flint, two-thirds showed marks of use, and half of those secondary chipping with some approach to design—surely a very economic use of material. In another I looked round for a good hiding-place and discovered—or, rather, was shown by a sharp-witted boy—a well-screened crevice high up by the roof; this notion, it appears, had likewise occurred twenty thousand years ago to some astute individualist, since the recess concealed the finest of Mousterian "points"—in fact, the catch of my season.



BEAUTIFUL SPECIMENS OF PALAEOLITHIC IMPLEMENTS

The fine Chellean coup-de-poing on the left, discovered in London beneath Gray's Inn Road, in London, in 1690, was the first Palaeolithic implement to be recognized as the work of Man, though its true significance was not perceived. The examples on the right show the advance in workmanship that can be traced from pre-Chellean to Acheulean in the same characteristic early type of implement.

From British Museum and V. Commont, 'L'Anthropologie'

USES OF A MOUSTERIAN 'POINT'

The trimmed bases of these Mousterian 'points' probably indicate that they were grasped in the hand, as in the above illustration. It is suggested that points were implements of all work, like pocket-knives today. Top center, a Mousterian disk.

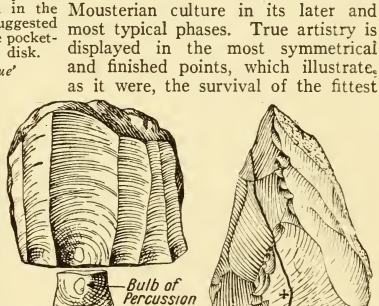
After De Mortillet, 'Musée Préhistorique'

No wonder, then, that the earliest cave-dwellers, being so sagacious, had the use of fire, without which, indeed, their caves would have been scarcely habitable in view of the rigor of the climate and the attentions of cave-bears. How they made it is suggested by the occurrence in their caves of iron pyrites, two lumps of which would provide a strike-a-light. How they used it is abundantly proved by their hearths, with adjacent bone-middens testifying to the rich stock of available game animals and to the effectiveness of their hunting methods. What these methods were, however, can hardly be deduced from the cave remains, and we can only suppose that the fashions of the age of wood persisted largely into these times, since their whole stone industry is suggestive of domestic and sedentary functions, such as cutting up the meat, or scraping the skins and boring holes in them for fastening as garments, or rounding off a stick with a hollow scraper used like a spokeshave.

Probably the typical instrument, the so-called Mousterian "point," was a universal tool, a sort of "sailor's knife," just as was its predecessor, the coup-de-poing.

As for the difference in form between the coup-de-poing and the point, it is the outcome of what amounts to no less than a revolution in technique. The one is essentially a trimmed nodule, the other a trimmed flake previously disengaged by percussion from a nodule. We need not postulate a genius who suddenly introduced a novel method which no less instantly found favor with all, perhaps because it was labor-saving. During Lower Palaeolithic times the flakes detached in the course of making the coup-de-poing were utilized and even trimmed.

However, to specialize on the flake implement and fashion it out of the choicest and most substantial segment of the nodule was reserved for the Mousterian culture in its later and most typical phases. True artistry is displayed in the most symmetrical and finished points, which illustrate, as it were, the survival of the fittest



LATER METHOD OF WORKING FLINT

Earlier workmen made tools from the cores of flint nodules; Mousterian craftsmen used flakes. Above (left) we see a nodule with a flake detached from it; and (right) an actual flake fitted into the parent nodule, which was also discovered. It will be seen that the flake was chipped before removal by a blow at the point x. The 'bulb of percussion' is the characteristic mark of human handiwork; it appears in the flake beneath the point of impact.

After Macalister, 'European Archaeology'

among numerous experiments, and occur in the proportion of about one to a hundred flakes in a representative Mousterian site, as Rutot has observed in Belgium and I can verify from Jersey. The well-trimmed base usual in this class of implements suggests that they were meant to be grasped in the hand.

A rather characteristic artifact, the so-called "disk," which, unlike the rest, is often worked on the lower as well as on the upper surface, has been interpreted as a missile for throwing or perhaps slinging; but it is simpler to regard it as the direct successor of those round Acheulean coups-de-poing which presumably served to cut and scrape. Such a circular edge is awkward to hold, and seems to imply some sort of hafting.

Dwarf flakes, an inch to an inch-and-a-half in size, showing marks of use and sometimes secondary chipping, were very frequent in the Jersey caves. There is no need to assume that any of these smaller Mousterian flakes were arrowheads, or that the bow had yet been invented, as there are a thousand other uses for a miniature cutting tool.

The only known use for bone at this time was as a sort of anvil or chipping block on which downward strokes could be made without blunting the edge of the flake. I have also found a large boulder the flattest top of which had been dented and almost hollowed out with hammering, probably in the course of breaking up marrow bones.

Upper Palaeolithic times are the golden age of prehistoric art. This would be so if we regarded simply what one might call works of pure art, namely, painting and statuary, did one not suspect a magico-religious purpose to have prevailed in most cases; but even the articles useful for everyday life were lavishly decorated, as if these ancient cave men rivalled the Greeks of Periclean Athens in their passion for sheer beauty.

Which kind of man it was that took the lead in this development—whether it was big and handsome Cro-Magnon, or small and perhaps negroid Grimaldi, or yet another of the divergent racial types that now begin to appear—is not at present determined; but, one and all, these "neanthropic" types can be contrasted with their "palaeoanthropic" forerunners as in all essential features akin to modern races, and, in fact, no more apelike than ourselves. Not that we need suppose the home comforts of these later cave men to have been strikingly superior to those of Neanderthal Man. I could not perceive, in excavating an Aurignacian floor, that the fare was more plentiful or varied; while the same untidiness and insensitiveness to smells were attested by the piled-up litter.

Yet that the culture was in every way more diversified and refined is the dominant impression yielded by their remains. Even the stone industry, which, except with the Solutreans, was perhaps something of a secondary interest, shows many a modified form: long, delicate blades, little scrapers of quaint design, limpet-shaped, parrot-beaked and so on; while the typical implement, the graver, the stand-by of the artist, is entirely new. In general, the coarser method of percussion flaking would seem to have been largely superseded by pressure flaking, already known to the Mousterian worker.

As for the Solutrean masterpiece, the "laurel leaf" point, trimmed on both flat faces by the finest pressure strokes—so that one can only suppose objects so exquisite and fragile to have had a ceremonial rather than a utilitarian function—it seems, with other characteristic implements such as a point with a single tang, to be the work of a people who thrust themselves in for but a while between two stages in the development of the genuine cave artists of the Aurignacian-Magdalenian tradition. The latter worked on bone, ivory and horn in preference to stone, as giving greater scope to their plastic and graphic efforts.

Some useful implements made out of bone, such as needles, polishers, spear-points and harpoons, do not greatly lend themselves to decoration. Others, however, such as the so-called wand, the spear-thrower and the arrow-straightener (if such it be, and not a chief's baton, as it used to be the fashion to term it), are often richly engraved.

Nay, the certainty of touch with which a few strong lines are made to express living forms in their essential features is altogether astonishing—as if fine art could approach perfection without waiting on the rest of culture to de-

velop correspondingly. And, of course, with this artistic skill there went dexterity in all branches of workmanship, as witness the minute eyes bored in some of the bone needles by means of flint awls, themselves appropriately delicate and hard to manufacture.

Further, while we are considering the utilitarian side of these cultures, let us note how inventiveness is by this time well in evidence. Thus, of the implements already mentioned, the spear-thrower—consisting of a long bone handle with a projection at the end into which the butt of the spear fits, so that the thrower gets an extra leverage by doubling, as it were, the length of his arm—is a most ingenious device.

The harpoon heads, too, have a swelling at the base, sometimes perforated, which shows them, if we can go by the analogy of the Eskimo weapon which is very similar in this respect, to have been detachable and connected with a line; this, held in the hunter's hand, would enable him to "play" his victim, perhaps a salmon and even more probably a seal—to judge from the fact that drawings of both these animals have come down to us from these days. The grooves, by the way, cut in some of these harpoon heads are probably not decorative but functional, and meant to hold some poison.

Thanks to these same drawings we can proceed far beyond the evidence afforded by the surviving artifacts themselves in our reconstruction of a material culture which, of course, consisted largely of perishable things. Thus, wooden clubs and spears of a great variety of form are depicted on the walls of the caves, where, as often as not, a game animal is portrayed with one or more of such weapons sticking in some vital spot—no doubt by way of prefiguration believed to make the prayer, or the spell, come true. There are, moreover, many mysterious pictographs which are variously interpreted as more or less symbolic representations of huts, nets, sledges and so on, and at any rate are suggestive of a many-sided mode of existence.

Meanwhile, in France and northern Spain, to which the typical Magdalenian culture is confined, it was apparently forbidden by custom, perhaps because it seemed magically dangerous, to adorn the cave walls with scenes of ordinary human life. But this taboo evidently did not apply to the contemporary inhabitants of eastern Spain—Capsians as they may be named in virtue of a presumed connection with North Africa. These people have left in their shelters a most vivid record of their daily avocations, and the hunting, dancing or fighting goes on before our eyes, very much as it does in the best examples of Bushman art in the South African shelters and caves.

We gather that the men were, at all events in their active moments, content to go mother-naked, if we exclude decorative trappings such as armlets, anklets and head-dresses made out of feathers. The women, on the other hand, wear seemly skirts reaching below the knee, and, though the breasts are exposed, there are signs of ornamental adjuncts to the upper part of the person; while, for the rest, the elaborate coiffures and the attenuated waists prove the age-long appeal of Vanity Fair. Teeth of various kinds, bored and with incised marks on them, were worn, as we may guess from the similar practices of the modern savage, to bring about sympathetic relations, on the homoeopathic principle, with the animals of which they were once part. Skulls of the cave-bear have been carefully despoiled of their teeth in the sacred cave of Tuc d'Audoubert, and doubtless the great beast, haunter of such uncanny places, was sacred, too.

As for the pierced shells, which from the beginning of the Aurignacian period form a prominent feature of the grave furniture, and were not only made up into necklaces and girdles, but must evidently have been also sewn upon the garments, these, too, may well have served as amulets rather than as trinkets; their presence in the graves suggests, like the red ochre in which the bodies were laid, some mystic purpose such as the revitalizing of the deceased. If it be true that some of these shells had found their way to Palaeolithic Europe from the Indian Ocean, some very widespread belief in the virtue of shells may be surmised.

Perhaps, it may be worth recalling in such a connection that in the island-strewn seas to the east of New Guinea

there is a custom of making long voyages for the purpose of exchanging, not trade goods, as a modern economist might reasonably expect, but rather luck-bringers, objects such as necklaces and armlets to which a mystic virtue is attributed—a virtue which is held to increase as the amulet acquires age.

Reverting to the genre painting of the Capsians, we note a striking fact in the presence of the bow, one of the decisive triumphs of early human invention. They are fine, large bows of more than one pattern; the arrows do not seem to be always, if ever, feathered, and the quiver is not in use. Dr. Macalister suggests that the Capsians coming up from North Africa may have been the first to introduce the bow into Europe. Certainly, the evidence for its use in Palaeolithic times to the north of the Pyrenees is not clear. The lighter darts depicted as adhering to the animals' sides in the Magdalenian rock-paintings may be hand-thrown assegais; while the Aurignacian bas-relief from Laussel, which incompletely represents a male figure with left arm extended—no bow-string, however, being shown, whereas lines indicate a girdle—is hardly convincing.

MASTERPIECE OF REALISM

To carve so virile and individual a horse's head as is shown above from reindeer antler, the Palaeolithic artist must have had real genius together with a very intelligently developed technique. The carving was found in the Magdalenian deposits at Mas d'Azil in the French Pyrenees.

So far we have been concerned with the utilitarian, though, even so, often highly decorative, side of Upper Palaeolithic culture. Turning now to the remains of sculpture and painting, enough has been said to make it probable that a mystic rather than a purely aesthetic motive underlay most of these efforts, at any rate apart from eastern Spain. A difficulty to be faced, however, is that magico-religious symbolism is usually unfavorable to realism or, as it may be termed, naturalism in art—as if the letter warred with the spirit, and too great an interest in the thing itself might interfere with the higher meaning which it was intended to convey by suggestion.

Now, sometimes we have every right to infer a symbolic treatment, as in the case of the female statuettes with secondary sexual characters emphasized to the point of exaggeration. Of course, they may have stood for the type of beauty appreciated at the time, a sort of "Hottentot Venus"; and there are those who detect definite steatopygy and other racial traits found among the South African Bushmen and their congeners. It is at least equally likely, however, that these figurines embody a fertility charm, and typify prolific motherhood in such a way as to bring out the idea at all costs and regardless of what actually occurs in the sensible world.

Again, in the cave of Montespan discovered in 1923 the clay figures of a bear and other animals are very rudely shaped; but, for one thing, the head of the bear is supplied by an actual skull, so that it is not improbable that the skin covered the rest; and, for another thing, the holes with which the figure is riddled prove that stabbing formed a part of the ritual of incantation, so that no lack of realism is due to the symbolism as such.

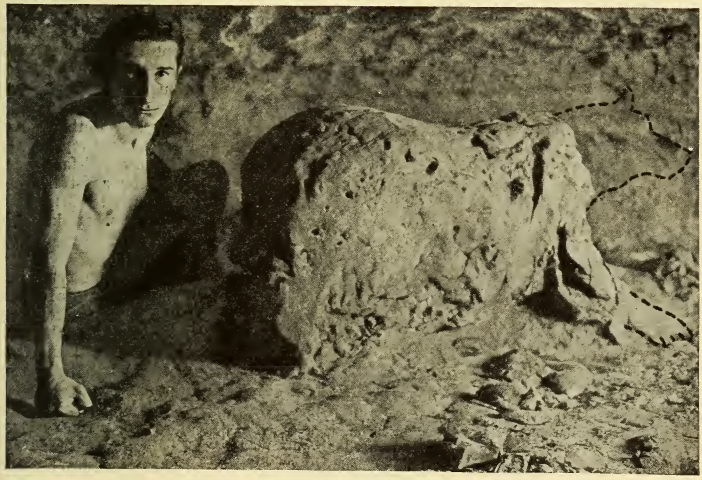
Contrast the other cave, Tuc d'Audoubert, where clay figures have likewise been preserved in a moist atmosphere caused by the proximity of a subterranean river. The two famous bison, male conjoined with female, are modelled with the greatest fidelity to Nature, and the accompanying rites probably involved not a mimic slaying, but an invocation to be fruitful and multiply; the abundant prints in the neighborhood of naked feet with heels deeply impressed show how, after the fashion of the modern savage, these early folk danced out their litanies, and, doubtless, could do so with greater expressiveness than they could think or speak them out.

Here, however, we are not directly con-

cerned with the motives of primitive art, except in so far as these are reflected in, or govern, the technique. Whatever reason we assign, the fact remains that all the most finished work is strikingly naturalistic in tone, while the rest appears to embody less successful attempts in the same direction.

In the order of chronological development sculpture seems, as compared with painting, to have led the way, and, at any rate with the Aurignacians, to have achieved high excellence, while the sister art remained tentative and reminiscent of a clever child's first efforts. Regarding design in the flat, I have seen in the cave of Niaux a beautiful little bison drawn with a finger in the sand and preserved by a thin layer of stalagmite, while close by was a most convincing trout executed in the same way. Bone, however, and in even greater degree ivory, lend themselves to carving, as do also some of the softer kinds of stone such as steatite and limestone. Out of such materials are, for instance, fashioned the figurines already mentioned, which, if mostly ill-proportioned in our eyes, however do not lack a certain technical merit.

Animals, however, rather than human beings, would seem to have inspired the cave artist to put forth his best, and some of these studies—that, for instance, of the head of a neighing horse from Mas d'Azil (page 150)—are among the world's masterpieces. The same contrast in the felicity of the rendering is noticeable in the two groups of wonderful reliefs cut in the living rock which Dr. Lalanne had the good fortune to discover. The human figures at Laussel are strongly wrought and interest us because of their possible relation to fertility cults and the like; but they are not beautiful. At Cap Blanc close by, however, a procession of sculptured horses and bison, eleven in all, runs round the wall of the shelter, and nothing could be finer than these reliefs, the product of rough stone



CLAY MODEL THAT HAS SURVIVED FOR 11,000 YEARS

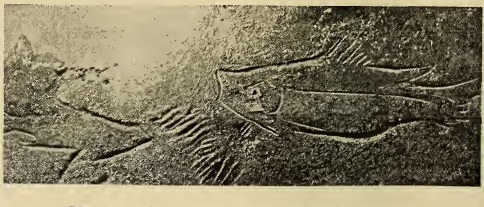
After swimming for nearly a mile, sometimes under water, through a subterranean stream, Norbert Casteret discovered, in the flooded cavern of Montespan, the Magdalenian clay model of a bear, shown above with its finder. Its head, shown dotted, was an actual bear skull which has fallen off; and the body was riddled with spear thrusts, thus showing how Prehistoric Man must have used it in his ritual as a magic image to prefigure the success which he hoped to enjoy in the chase.

tools, yet every one of them true to life.

To pass from sculpture to painting, taken together with the allied art of engraving, four chief phases of development are distinguishable for the northern region—that is, for France with the Cantabrian district of Spain—only one of which is Aurignacian, the remaining three being Magdalenian. In the first phase, some of the early attempts can hardly rank as art at all.

Thus, in the way of engraving we find so-called arabesques composed of a meandering series of roughly parallel lines. Their significance, if any, is hard to guess; but they may have been intended, possibly with a totemic purpose, to imitate the actual claw-scratchings of the cave-bear, such as may be seen on the same cave walls to this day.

So also, if we turn to painting, it perhaps hardly amounts to art to stencil the hand by placing it on a greased surface and blowing charcoal or red ochre from the mouth, so as to get the print in outline doubtless with some mystic purpose in view, as is further suggested by the fact that often the fingers are mutilated, as if by way of sacrifice.

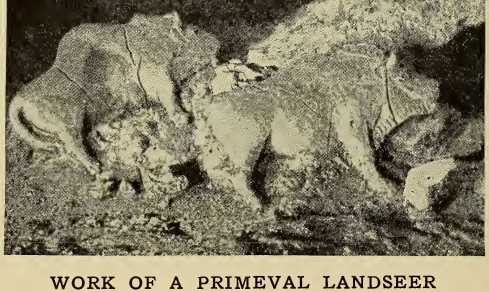


STUDIES FROM LIVING MODELS

Figures of some animal figures, e.g. this trout, in the cave of Niaux, are executed in sand, and it seems reasonable to suppose, therefore, that they were impressionistic sketches made by the artist while the originals were vivid in his mind—sketches that would refresh his memory when he came to draw on rock.

After Breuil, 'L'Anthropologie'

However, true art makes its first diffident appearance in the form of outline drawings of animals, either incised with a graver or in monochrome paint. Usually the body is in profile and only one front leg and one back leg are shown at first, though four legs appear before this phase is concluded. Both horns, however, are represented as if in a full-face view, since the artist has not yet learnt to distinguish between what he sees and what he merely thinks.



WORK OF A PRIMEVAL LANDSEER

Perhaps because the ritual, as part of a fertility cult, did not demand their mutilation, the two amazing bison, male and female, in the Tuc d'Audoubert are a far more lifelike effort than the Montespan bear. Like it they have been preserved by the presence of water that has kept the clay moist.

From Bégouen, 'L'Anthropologie'

In the second or Lower Magdalenian phase there is altogether more life in the engraved figures; the perspective of the horns and the shaping of legs and hoofs receive due attention, while within the outline there are slight attempts at shading. Moreover, engraving now begins to be associated with painting, the monochrome line of paint often being laid fairly thickly on top of a previously engraved outline and then cleverly broadened out

so as to give the effect of shading.

In the third or Middle Magdalenian phase, engraving has become confined to rather small figures, which in certain examples, however, such as those from Teyjat, display excellent quality. Painting has, in the meantime, suffered a setback, having been seduced into experiments in flat wash and in a sort of chessboard arrangement of red and black, which were disappointing. The result is that in the fourth or Upper Magdalenian phase, whereas engraving is now confused and decadent, painting recovers something of the splendour of the second phase, but by elaborating its methods and mixing its paints, these extraordinary polychromes being likewise in some cases helped out with the graver.

Occasionally, too, there is a discernible tendency towards impressionism, the lower parts of a mammoth at Font de Gaume appearing as a mass of shaggy hair, with a gap below across which the eye travels to four barely indicated feet. Altogether, this latest art smacks of the school rather than of Nature, and may have helped to bring about its own final disappearance by becoming too self-conscious and preoccupied with style, though doubtless there were about this time other causes—for instance, climatic changes—at work to overwhelm the Magdalenian culture in general ruin.

Meanwhile, this division into phases applies only to the three northern centers of artistic ascendancy, the Dordogne, the French Pyrenees and Calabria.

As for eastern Spain, where there is little engraving and the painting has both an outward style and an inner spirit of its own, a certain development here also can be traced, thanks to the custom of those days which tolerated the superimposition of one picture on another.

A word may be added about the artist's outfit. His paints, consisting of red and yellow ochre, black oxide of manganese and so on, were pounded on schist tablets which served as palettes, and were stored in hollow bones, or sometimes might be made up into a sort of pencil, looking

CAVE ARTISTS WORKING BY THE FLICKERING LIGHT OF STONE LAMPS

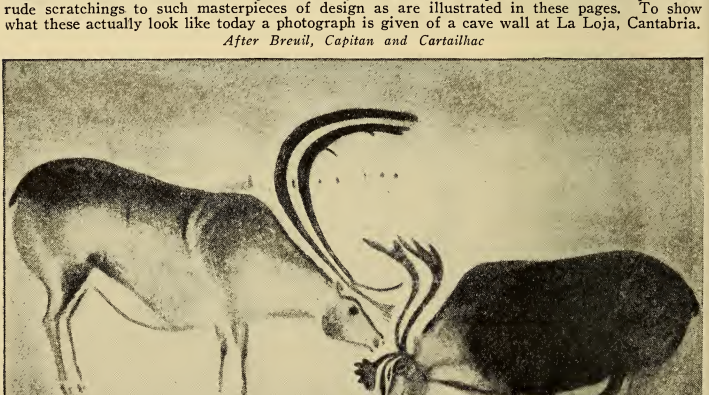
Some idea of the disabilities under which palaeolithic artists had to labor is afforded by this reconstruction of a scene in one of their galleries. The lamps would always have to be held in position by assistants, and the light must have been exceedingly dim and smoky. It will be noticed that the artist who is standing upright uses a rude palette upon which to mix his paints.

Reconstruction by Charles R. Knight, courtesy of American Museum of Natural History

ENGRAVING EXECUTED BY PALAEOLITHIC MASTER ARTISTS

Before he was a painter, Palaeolithic Man expressed his artistic soul in engraving, and in the cave academies of France and Spain we may trace the development of his technique from rude scratchings to such masterpieces of design as are illustrated in these pages. To show what these actually look like today a photograph is given of a cave wall at La Loja, Cantabria.

After Breuil, Capitan and Cartailhac



PREHISTORIC DEER IMMOBILIZED AT FONT-DE-GAUME

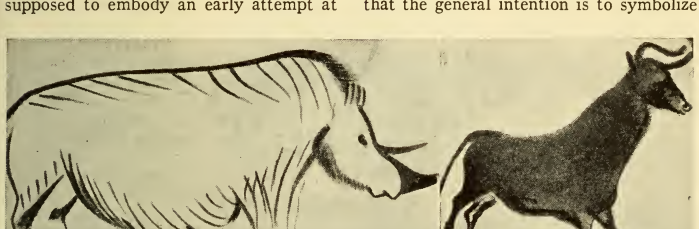
Here we have represented another superb specimen of prehistoric art, preserved through the ages in the Font-de-Gaume cave. The two deer, one kneeling down to graze, are pictured with extraordinary realism, and the work bears witness to the exact observation and retentive memory of the artist who executed it.

From Capitan and Cartailhac, 'La Caverne de Font-de-Gaume'

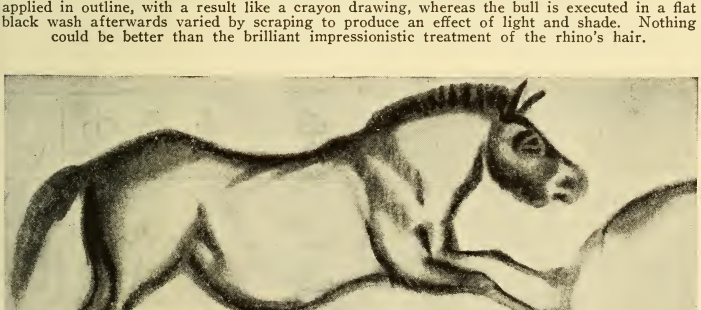
just as if it had come from a modern stationer's shop; a bone stylus was also used to lay on the color. All these things have been found, as well as the stone lamp, very like an Eskimo's, by the dim light of which an uneven face of rock, hidden away in the black interior of a mountain, was adorned with shapes as glorious as time-defying.

Now it remains to speak of those engraved or painted signs which may be supposed to embody an early attempt at writing. There can be no doubt, I think, that veritable pictographs were in use. At Niaux, for instance, in one special part of the long gallery a considerable distance away from any of the pictures of animals, one sees a large group of such marks—dots and strokes and other more complex signs distributed over the rock surface.

One seems to make out amongst them the forms of clubs and other vague adumbrations of actual objects, but it is clear that the general intention is to symbolize



Two methods of using paint are here illustrated. For the woolly rhinoceros red ochre has been applied in outline, with a result like a crayon drawing, whereas the bull is executed in a flat black wash afterwards varied by scraping to produce an effect of light and shade. Nothing could be better than the brilliant impressionistic treatment of the rhino's hair.



PAINTINGS PRODUCED IN THE DEPTHS OF GLOOMY CAVERNS

We do not know when the horse was first domesticated. It was introduced from the East into Egypt, for purposes of war, only in the seventeenth century B.C., and was almost certainly never bridled in Palaeolithic Europe. This wonderful wild horse in the Font-de-Gaume cave, then, was hunted as prey like any other game, and not used in the service of Man. It is done in black.

After Breuil, Capitan and Cartailhac, 'Peintures des Cavernes Paléolithiques'

rather than to represent directly. In another part of the cave such signs occur close to the picture of a wounded bison—one, by the way, which has for its back simply a projecting gable of rock of just the right shape—and here one is tempted to read off the inscription as the spell

MAN'S EARLIEST METHODS OF WRITING?

It is possible that Palaeolithic Man had evolved a sort of writing. At Niaux a figure of a dead bison is accompanied by symbols which apparently refer to it; while on a rod of reindeer horn from La Crozo de Gentillo are engraved signs which may be crude symbols, or perhaps they are a hunter's tally.

After Cartailhac and Breuil, 'L'Anthropologie'

expressive of the weapons and the encircling tactics whereby the death of the quarry is to be encompassed; there are marks like clubs and circular patterns of dots which may stand for the hunters or for their tracks.

Then there are engraved marks on objects of ivory and bone, the most striking example being the ivory rod from La Crozo de Gentillo, which has been compared with an Australian message-stick; these may well have been mnemonic signs to help the bearer to remember the terms of his report, or to enable a hunter to keep tally of his victims, or perhaps, in other cases, to convey a spell or to indicate private property.

From the standpoint of arts and crafts, the succeeding age, conveniently termed the Epipalaeolithic, is one long chapter of backwardness and squalor. The dry cold of the Magdalenian period had given way to damp and dreary conditions—a sort of protracted thaw. The cold-loving fauna had retreated north, followed possibly by the most vigorous of the hunting tribes. If any of these remained behind, they, in company with the immigrant peoples that gradually arrived, had to accommodate themselves to new material, as witness the harpoon heads of the Azilians; these, formed out of red-deer antler, seem decidedly clumsier than those which the Magdalenians used to carve from the now unprocurable reindeer horn.

Fine art had perished. Probably its development was bound up with peaceful and settled conditions, whereas the Capsians, who herald immigration from the south, are convicted by their rock-drawings of a fondness for war, the defeated foe bristling with the arrows that have been shot into him. Promoted by these methods, invasion by the Azilian-Tardenoisian folk, who apparently followed the Capsians, may have soon extirpated all taste for the gentler pursuits of life.

At most there survived, as is to be seen best in Spain, a highly stylized mode of representing men and animals, which as fine art is con-

MAN GROTESQUELY SYMBOLIZED

The designs on the painted pebbles from Mas d'Azil closely resemble other Palaeolithic figures which definitely symbolize men and women. Above, some Azilian pebble designs (right) are compared with Palaeolithic Spanish versions of human beings.

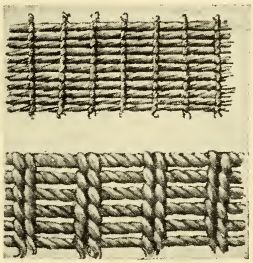
After Obermaier, 'El Hombre Fósil'

temptible, but may have served some religious or pictographic purpose. The famous Azilian pebbles with their queer markings have given rise to all manner of ingenious interpretations, but today the prevailing view is that these signs, some of them not unlike the letters of our alphabet, are one and all highly stylized versions of the human figure.

Concerning stonework, the output of this period is poor, and one must suppose that there had been a reversion to the use of wood. For the rest, though the study of this period is important as a key to the earlier movements of the present population of Europe, with its mixture of long-heads and broad-heads, the cultural remains of such middenfolk would scarcely repay a more extended notice.

An economic revolution due to the domestication of animals and plants brought about a contrast in the life of Europe as great in its way as that exhibited between the habits of red man and white man in North America. The contrast was all the sharper because the new culture had originated outside Europe, and was at once too alien and too advanced to assimilate any essential features of the previous dispensation. Thus, to explain the Robenhausian culture so-called, namely that of the Swiss lake-dwellers, with their characteristic kine, swine, cereals and so on recourse must be had to the analogy of far-off Anau in Turkistan, where the Pumpelly Expedition found much the same things in use at a date estimated to be considerably earlier than the organization of the great river civilizations of Mesopotamia and Egypt. Such a hypothesis of a foreign derivation need not debar us from holding that Switzerland itself, if it did not initiate, at least had fruitfully developed the new principle that Man henceforth was to be the master, and not the slave, of Nature.

When assisting at the excavation of a site on the shore of the Lake of Neuchâtel, where two settlements, both equally devoid of any trace of bronze, lay one over the other, I was much struck with the vast superiority of the later one. Not only were the piles of the earlier lake village short and feeble, while those of the later one testified to excellent carpentry, but from the stratification observable in the copious deposits—all the more plentiful, no doubt, because each structure in turn had been destroyed by fire—it was clear that, whereas the first group had lived strictly on local products, the very stone for their implements being poor stuff from near at hand, the second set of inhabitants had established trade relations extending hundreds of miles in at least three directions. For they had amber from the Baltic, shell necklaces from the Mediterranean and fine homogeneous yellow flint from Grand Pressigny in France.



CLOTH OF THE LAKE-DWELLERS

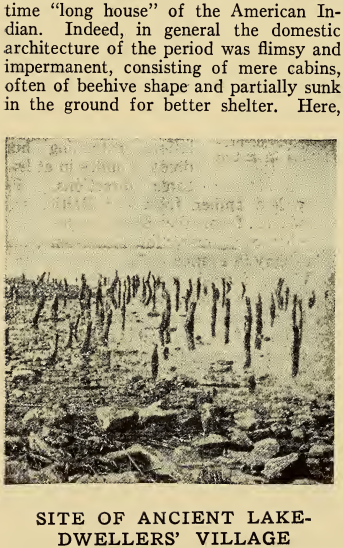
In the New Stone Age cloth was used for garments, and, judging by surviving samples, the lake-villagers were already expert in the art of weaving. Above, we see two types of coarse cloth made of flax, found near Swiss lake-villages at Robenhausen, preserved through the ages in a bed of peat.

When, indeed, we consider this lake culture as a whole, we cannot but marvel at its richness; a tour round the splendid museums of Switzerland is needed in order to bring the impression home. Peat is a wonderful preservative, enabling us to take stock of the industry in wood; in these Swiss deposits we have the hafts of wood or deer-horn, in addition to the stone axe, as well as examples of their fabrics, woven materials, string nets and basketry, and even of the grain or nuts which were eaten. Allowance being made for the inevitable absence of similar relics of Magdalenian times, it still remains obvious how far Man has advanced in material comfort.

Even so, security of a purely economic order may be purchased dearly if, as the result of increasing wealth, with corresponding density of population, there is

more bitter conflict between men to offset a mitigated struggle with Nature. The lake-dweller may have been partly led to adopt his amphibious way of life by the fear of wild beasts such as wolves; but the analogy of modern Malays or Papuans, with their pile-dwellings of very similar construction, suggests that the primary object was self-protection from human enemies. In the Swiss examples the dwellings were quite near the shore, but doubtless a removable causeway connected it with the platform on which were the huts of wattle and daub.

The frequent destruction by fire, of which there is ample evidence, may, conceivably, be the work of enemies; but one must also give due weight to the fact that the primitive wooden hut, with a flat stone for its hearth, was particularly liable to such disaster. This, for instance, was also the constant fate of the old-time "long house" of the American Indian. Indeed, in general the domestic architecture of the period was flimsy and impermanent, consisting of mere cabins, often of beehive shape and partially sunk in the ground for better shelter. Here,



SITE OF ANCIENT LAKE-DWELLERS' VILLAGE

The construction of easily defensible villages over water marked a great advance in civilization. The dwellings were raised on piles—here we see the broken stumps of piles that once supported a village on the shores of Lake Morat, in Switzerland—and remains show the engineering skill of the builders.

no doubt, as in a Lapp dwelling today, the folk herded together, glad to be protected from the weather, and not greatly minding stuffiness and the fleas.

On the other hand, in startling contrast to the meanness of the abodes of the living, the dead are housed magnificently in erections of unhewn stone that last to this day. This at least holds for the so-called Megalithic Zone, which runs more or less coastwise from the Black Sea and Mediterranean round by the Atlantic and North Sea as far as the Baltic, leaving the central parts of Europe unaffected.

Compared with lake-dwellings and megaliths, taken with all their cultural associations, the remaining topics that relate to the period are, no doubt, of minor importance. A word, however, is needed about the dawn of the art which, from this point onwards, affords the archaeologist his best evidence for differentiating and dating the various cultures: namely, the art of ceramics.

Pottery of a rude kind, it has been asserted, is occasionally found in Palaeolithic sites, and I have myself found on a Mousterian hearth portions of fire-hardened clay which a credulous person might easily take to be rudimentary potsherds. It is safer, however, to regard the potter's art as introduced into western Europe along with the rest of the food-producing tradition. Certain it is that in the Eastern Mediterranean, when copper was barely known or not at all, fine ware could be made, whereas the much later advent of bronze in the West found the pottery still coarse and wanting in variety of form.

It remains to consider the stone-work which, after all, gives the Neolithic Period its distinguishing name, though this corresponds to superficial distinctions. To think of it as the period of polished stone is misleading for at least two good reasons: one, that much of the stone was not polished; the other, that the process, once begun, went on well into the Age of Metal. Polishing, or at any rate grinding, which is not quite the same thing, goes back at least to Epipalaeolithic times, when it was occasionally applied to flint, after chipping, to get a better edge.

How Palaeolithic Man failed to discover it I cannot think, since Mousterian

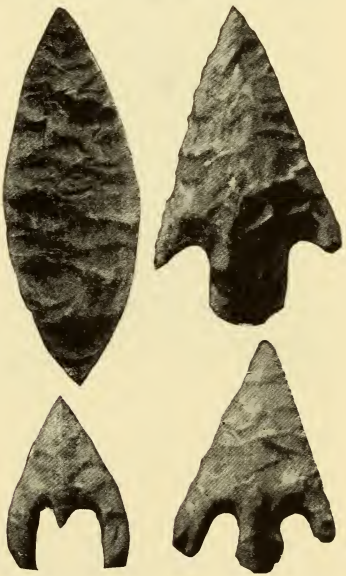
slices of greenstone show rubbed edges which were almost certainly produced by human agency, though no doubt accidentally in the course of some culinary operation such as braising roots. Probably a conservative predilection for flint prevented the earlier stone-workers from taking advantage of a method less suitable for flint than other kinds of stone—diabase, jadeite and so on, which it was left to Neolithic Man to appreciate. Most of these are rather richly colored stones which appeal to the eye, and certainly the best Neolithic celts are meant for show at least as much as for use. Contrast the rough Australian celts which almost invariably have no more than the edge ground and, however serviceable, are ugly.

However, in Europe not only was the necessary sharpness produced by grinding, but in the best examples the whole surface is polished to a uniform brightness, due attention being likewise paid to complete symmetry of shape. Probably a ceremonial use once attached to many of the choice specimens now figuring in our collections.

As for the mode of manufacture, any gritty rock surface might be used as a grindstone, and the grooves so made are often still to be recognized. Polishing, however, especially if the material of the celt be hard, involves far more labor than grinding an edge, though perhaps no greater skill. Of hafting such a celt several Neolithic fashions are known and more may be suspected. A very simple plan, for instance, is to bend over a flexible stick and make it fast underneath by binding, the Australian native using gum for this purpose, in which case notching or grooving the stone may be employed to give the handle a better grip. But the typical way, more especially with a blade of almond shape, is to thrust the tapering end through a hole in a thickish wooden haft reinforced with sinew or other binding material so as to prevent splitting.

Another method, involving perforation of the head either by picking with a flint awl or by twirling a stick loaded with wet sand, might suit a ceremonial better than a practical use, since the stone is apt to crack at the place of boring. Or, finally, the blade may simply have its butt driven into the handle, whether this be at right angles to form axe or adze, or endwise as in a chisel.

Next in importance to the celt in a series illustrating Neolithic stonework is the arrowhead; though, since the bow dates back to the Upper Palaeolithic, while on the other hand metal, long after it was in use, was too valuable to prefix to a vagrant missile, it is far easier to determine the type than the sequence-date of a given find. It is a fair guess, however, that when flint was first adapted to this purpose, a sharp point was of chief concern and a convenient base for attachment a secondary matter. From a lozenge-shaped flake a tang which could be stuck into a hole in the shaft would evolve,



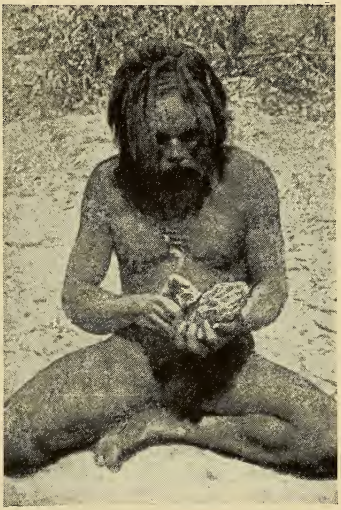
NEOLITHIC ARROW-HEADS

Neolithic cultural advance is shown by the evolution of long-barbed arrow-heads (below) from the clumsier type (top right) whose barbs are merely the shoulders formed when a tang is cut in the simple, lozenge-shaped form of arrow-head (top left).

From the British Museum

by having the flanking edges cut until first horizontal shoulders and then recurving barbs would be formed.

As for other varieties of Neolithic stonework, it would be too long a task to enumerate the forms without number which an age of increasing specialization in the arts of life was bringing into existence—an age, too, which was the heir of the previous ages and freely selected among traditional patterns. Indeed, it is often hard to distinguish from Upper Palaeolithic specimens, as regards their type, implements which have a definite Neolithic horizon, or, at any rate, are associated with pottery and the bones of domesticated animals; the explanation being in part, perhaps, that Capsian and post-Capsian immigration from the South brought into Western Europe a tradition going back to the Aurignacian.



WHERE IMPLEMENTS OF PREHISTORIC TYPE ARE STILL IN VOGUE

The Stone Age has not yet passed where primitive peoples are concerned. Most backward among these are the Australian aborigines, who still use implements reminiscent of European Neolithic and Palaeolithic cultures. Of a Neolithic type is the axe-head which we see above being chipped.

From Spencer & Gillen, 'Across Australia,' Macmillan & Co., Ltd.

For the rest, there are found in England and elsewhere plenty of Neolithic implements of almost pre-Chellean coarseness, some of them doubtless unfinished instruments or rejects, while others may be for rough use in the fields as hand-picks or hoes. At the other end of the scale the Neolithic Age can compete in refinement of execution, involving pressure-flaking and the most delicate sense of symmetry, with the best Solutrean work; so that, indeed, it takes an expert to distinguish the two styles.

Scandinavia, in particular, where the Stone Age seems to have enjoyed a sort of St. Martin's Summer, produced masterpieces such as the Danish hand-daggers and half-moon blades which, if we leave out of account the Solutreans and the ancient Egyptians, no other people of the ancient world could equal or even approach.

Beauty apart, however, the Egyptians, perhaps, hold the palm for cleverness, since they could even chip flint into rings and bracelets. A famous flint-knapper of Brandon in Suffolk confessed to me that with all his modern tools he broke down at that point.

Mention of Brandon, with its flint industry, which includes both mining for the material—in mines similar in all respects to ancient ones such as Grime's Graves, with its tunnelled shafts and deer-horn picks—and chipping it into the gun flints and tinder-lighters still in request in backward parts of the world, will serve, in conclusion, to remind us that even now Stone Age ways persist. They are found chiefly, of course, among savages, yet in minor matters even among ourselves—as a visit, say, to the Scottish Hebrides would very soon show.

First Era

EARLY CIVILIZATIONS

4000 B.C.-550 B.C.

CHRONICLE I—Twilight, 4000-1580 B.C.

CHAPTER

7. The Rise of Ordered Civilizations — *Prof. J. L. Myres, D.Sc., F.B.A.*
8. Early Egyptian Life and Culture — *Prof. T. Eric Peet*
9. Mesopotamia's City States before the Rise of Babylon — *C. Leonard Woolley*
10. Life of Egypt under the Middle Kingdom — *Prof. T. Eric Peet*
11. Babylonia in the Days of Hammurabi — *R. Campbell Thompson, D.Litt.*
12. Survey of Early Mediterranean Cultures — *Prof. R. A. S. Macalister*
13. Europe in the Ages of Stone and Bronze — *Prof. Sir Bertram Windle, D.Sc., LL.D., F.R.S.*
14. The Gods of the Twilight — *Stanley A. Cook, Litt.D.*

CHRONICLE II—Dawn, 1580-900 B.C.

CHAPTER

15. The Egyptian Empire: Its Splendor and Decline — *Prof. F. Llewellyn Griffith, LL.D., F.B.A.*
16. The Empire of the Hittites — *Prof. John Garstang, D.Sc.*
17. The Religious Revolution in Egypt — *Prof. Llewellyn Griffith*
18. Minoans & Mycenae: How Civilization Came to Europe — *Prof. J. L. Myres*
19. The New Peoples: A Study of Race Movements — *Prof. R. A. S. Macalister, Litt.D., LL.D.*
20. Israel in the Light of History — *Rev. T. H. Robinson, D.D.*
21. The Greeks in the Heroic Age — *Prof. E. A. Gardner, Litt.D.*
22. Troy: Its Place in Literature and History — *A. J. B. Wace*

CHRONICLE III—Daylight, 900-550 B.C.

CHAPTER

23. Growth of Culture in Barbaric Europe — *V. Gordon Childe*
24. Imperial Nineveh & Babylon — *R. Campbell Thompson*
25. The Dorian Invasion and the Ionian Migrations — *Prof. W. R. Halliday*
26. Egypt in the Brilliance of Decay — *H. R. Hall, D.Litt.*
27. Greece on the Eve of Her Greatest Glory — *Stanley Casson*

This, the third division of our work, comprises the First Era of record history; it narrates the growth and collapse of the ancient empires down to the first flowering of Hellenism and the entry of Persia on to the world's stage, thus preparing it for the epic contest between these two rival cultures. As for dates, all that lie before 1580 B.C.—the concern of Chronicle I—are the merest approximations; thereafter, world chronology, within a year or two, gives rise to no serious disputes.

First Era: 4000-550 B.C.

TABLE OF DATES

Chronicle 1. 4000-1580 B.C.

Egypt and the West		B.C.	*Mesopotamia and the East*
4241	Invention of Solar Calendar in Egypt? Predynastic period: Upper and Lower Kingdoms.		Sumerians established in Babylonia. Semitic Dynasties recorded at Kish.
c.3800	Brick cemeteries in Egypt. Copper in use. Early Minoan Period I in Crete: Bronze in use.	c. 4000	Sumerian Dynasties recorded at Erech, Ur, etc.
3400	First Egyptian Dynasty; Narmer (Menes?) combines Upper and Lower Kingdoms. Memphis refounded.		
2980–2900	Third Egyptian Dynasty (Khasekhemui). Memphis made capital. First Stone Pyramid (Zeser). Sneferu conquers Sinaitic Peninsula.	c. 3000 c. 2925	Ur-Nina, priest-prince of Lagash. Eannatum of Lagash. Lagash at war with Umma. Stele of Vultures. First contemporary records.
2900–2750	Great Pyramid Age in Egypt (Khufu and Khafra—Fourth Dynasty). Crete: Early Minoan II.	c. 2850	Entemena of Lagash.
c.2870	First City of Troy.		
		2781	Urukagina of Lagash.
2750	Fifth Dynasty. Pharaohs thenceforth deified.	2775 2750 c. 2670	Conquests of Lugal-zaggisi. Sargon founds Agade; Semitic Empire. Pamba, Hittite king ruling at Hattusas. Stele of Naram-Sin.
		2542–2416	Inroad of Gutians into Babylonia; period of anarchy.
2430	End of "Old Kingdom" in Egypt; first interregnum of anarchy.	c. 2450	Gudea of Lagash. Aryan migrations in progress; dates uncertain.
	Heracleopolitan usurpers; invasion of Asiatics. Crete: Early Minoan III.	c. 2400	Independent kings of Assyria; Ushpia and Kikia.
2160	"Middle Kingdom" begins with Eleventh Dynasty. Thebes the capital. Bronze now common.	2409 2252 2123–2080	Sumerian Empire under Ur-Engur at Ur. First Babylonian Dynasty (Semitic). Hammurabi at Babylon. (Code, 2090).
	Crete: Middle Minoan I.	2072	Kassite raid.
2000	Twelfth dynasty. Great revival of Egyptian Art. Crete: Middle Minoan II.	2070 2000	Dynasty of "Sea Country" Kings; hostilities with Babylon. Expansion of Hittites under Hattusil I.
1788	Succession of weak dynasties in Egypt; second interregnum of anarchy. Middle Minoan III in Crete.	1926	Hittite raid on Babylon under Mursil I.
	Hyksos conquest of Egypt—two dynasties; introduction of war-chariot.	1746	Kassite conquest of Babylon, and Dynasty
1600	Egyptian war of liberation; Seventeenth Dynasty ruling at Thebes.	1700	Establishment of Mitannian kingdom on Upper Euphrates (now or earlier).
1580	Expulsion of Hyksos by Thebans. Aahmes founds "New Kingdom." Crete: Late Minoan I.		Assyria independent and overlord of Middle Euphrates.

Chronicle 2. 1580-900 B.C.

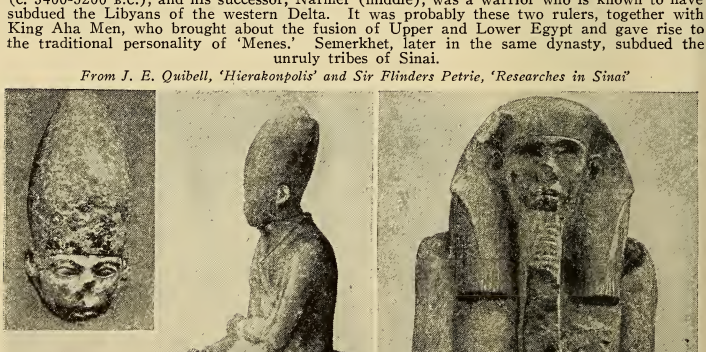
Egypt and the West			*Mesopotamia and the East*
1580	"New Kingdom" of Egypt. First Empire.		Kassite Dynasty still reigning in Babylon.
1543	Thothmes I marches to Euphrates	1543	
1501–1479	Reigns of Thothmes II, Queen Hatshepsut and Thothmes III. Expedition to Punt.		
1479	Battle of	1479	Megiddo.
1474	Thothmes III reconquers	1474	Syria and crosses Euphrates.
1412–1360	Development of diplomatic relations	1412–1360	between Egypt, Babylon, Mitanni, Hittites, Assyria.
			Growth of Hittite power under Subbiluliuma. 1395–1350
1375–1358	Religious Reforms of Akhnaton. Akhetaton founded at Tell-el-Amarna Crete: Late Minoan II and III.		Ashur-uballit; Assyrian activity begins. 1381
	Period of the		Amarna Letters
1358	Tutankhamen. Disruption of Egyptian possessions		in Syria; End of First Empire.
1350–1321	Crete: Sea Power of "King Minos"? Internal reforms of Harmhab.		
		1345	Accession of Mursil III to Hittite throne
		1320	Accession of Mutallis.
1321	Second Empire: Rameses I. Hittite	1315	and Egyptian contests in Syria. Adad-nirari I of Assyria; defeats Kassites.

B. C.		B.C.
1296	Battle of Kadesh between	Rameses II and Mutallis. 1296
1280	An "uti possidetis" peace	between Hittites and Egyptians. 1280
		Shalmaneser I; conquests in Asia Minor. 1276
	Iron in use in Egypt.	Tukulti-Ninurta of Assyria; wars with 1256
1225	Merneptah: reputed Pharaoh of Exodus.	Hittites; defeats Kassites.
		Great migrations of northern peoples; c. 1200
1221	First Raid on Egypt by "Peoples of the Sea."	Philistine invasion and settlement.
		Extinction of Hittite power.
1190	Second raid by "Peoples of the Sea." Philistines defeated in sea battle.	
	Achæan expansion. Fall of Troy.	Ashur-dan of Assyria breaks Kassite power. 1174
1090	End of Egyptian Empire; disruption.	Babylonian raid on Assyria; Assyrian relapse. 1107
	Dorian expansion.	Hebrew kingdom: Saul. c. 1025
		Aryan domination in Northern India.
947	Shashank (Shishak) founds Twenty-second Dynasty and reunites Egypt; Bubastis the capital.	
	Nubia independent.	Disruption of Hebrew kingdom. 945
930	Shashank invades Palestine	and captures Jerusalem 930
		Adad-nirari II; revival of Assyria. 911

c.900	Etruscan and Latin penetration of Italy?	
	Homeric poems.	Assyrian chronological record begins. 893
	Development of Greek city states.	Tukulti-Ninurta II; wars with Urartu 889–
		(Armenia); recovery of Assyrian power. 884
884	Laws of Lycurgus, Sparta (traditional).	Ashur-nasir-pal II marches to Mediterra- 876
		nean.
860	Thebes and the Delta under independent	Syrian confederation headed by Ben-Hadad; 853
	rule.	alliance with Ahab of Israel; battle with
		Shalmaneser III at Karkar.
		Civil wars in Assyria. 827
		Order restored in Assyria. 821
800	Carthage founded (traditional).	
776	First Olympiad; Greek Chronology.	
753	Rome founded (traditional).	
745	Complete disruption of Central Authority	Tiglath-Pileser II. 745–
	in Egypt; Kashta the Nubian holds Thebes.	727
734	Syracuse founded.	
722	Piankhi the Nubian invades Egypt.	Supremacy of Assyria; Sargon II. 722
720	Defeat of Egyptians	by Sargon at Raphia 720
		End of Kingdom of Israel. Rise of Mushki
		(Phrygia).
705	Tarentum founded.	Sennacherib. 705–
		681
700	Defeat of Egyptians by	Sennacherib at Eltekeh 700
	Sparta predominant in Peloponnese.	Rise of Media and Lydia.
		Babylon taken and sacked. 690
689	Taharka (Tirhaka) the Nubian king in	
	Egypt.	
683	Annual archons at Athens.	
		Esarhaddon. 681–
		669
671	Egypt subdued by	Esarhaddon of Assyria. 671
669–626	Ashurbanipal (Sardanapalus) establishes	Assyrian overlordship in Egypt. 669–626
663	Psammetichus I founds Twenty-sixth Egyptian	
	Dynasty; revival of art and power.	
625	Periander "tyrant" of Corinth.	
		Alliance against Assyria of Cyaxares the 620
		Mede and Nabopolassar the Chaldæan.
		Destruction of Nineveh by Medes and 612
		Babylonians.
		Neo-Babylonian Empire founded by Nabo-
		polassar.
605	Final defeat of Assyrians and	Egyptians under Necho by Nebuchadrezzar 605
600	Thales of Miletus.	at Carchemish.
	Etruscan (Tarquin) Dynasty at Rome.	
594	Solon's legislation at Athens.	
		End of Kingdom of Judah: Babylonian cap- 586
		tivity.
570	Servian reforms at Rome (traditional).	
569–	Aahmes II (Amasis) king of Egypt; rela-	
526	tions with Greeks.	
		Croesus King of Lydia; conflicts with 565
		Medes.
560	Peisistratus tyrant of Athens.	Birth of the Buddha. c. 560
		Birth of Confucius. 551
		Rise of Cyrus the Persian. 550

Ip, 'the Scorpion' (left), would seem to be the earliest king of the First Dynasty in Egypt (c. 3400-3200 B.C.), and his successor, Narmer (middle), was a warrior who is known to have subdued the Libyans of the western Delta. It was probably these two rulers, together with King Aha Men, who brought about the fusion of Upper and Lower Egypt and gave rise to the traditional personality of 'Menes.' Semerkhet, later in the same dynasty, subdued the unruly tribes of Sinai.

From J. E. Quibell, 'Hierakonpolis' and Sir Flinders Petrie, 'Researches in Sinai'



As the founder of a line of powerful kings—the Third Dynasty (c. 2980-2900 B.C.)—Khasekhemui (left) is a figure of considerable importance; his carven portrait, damaged though it be, suggests a resolute man of keen intelligence. His son Zeser, who succeeded him, firmly established his house on the throne of Egypt, and seems to have governed with a strong hand and to have extended the frontiers. An index of Zeser's importance is his pyramid at Sakkara, the first built.

MONARCHS WHO LAID THE FOUNDATIONS OF EGYPT'S GREATNESS

Statue of Khasekhemui from J. E. Quibell, 'Hierakonpolis'

TWILIGHT: 4000-1580 B.C.

THE basins of two great rivers, the Nile and the Euphrates, were the cradles of civilization; not of mankind, but of civil institutions. It was here, so far as we know, that men first organized societies on a large scale, and first consciously created for the admiration and instruction of posterity lasting records of their own activities.

Organization in the Nile valley was already far advanced and covered a very large area when the first recognizable records were made. They begin at the point where the kingdoms of the North and South, that is Lower and Upper Egypt, or the Nile Delta and the Nile between the Delta and the cataracts, were united under a single Pharaoh; the point where the First Dynasty emerges.

The latest date to which this event can be assigned is 3400 B.C., although dates as high as 5000 B.C. are still sometimes quoted. In the Euphratic, or Mesopotamian area, although traditions that can often be verified tell of dynasties to which we may assign dates going back to 3500 B.C. (but compare Chapter 9), the first contemporary records can hardly be dated before 3000 B.C.

In this sense, at any rate, it is in the Nile valley that the chronicle of civilized mankind begins. It is here that we first get statements made for the information of posterity, at the time when the events took place, decipherable in this twentieth century of our era. From this evidence we can draw with confidence certain conclusions as to the preceding centuries, the 'predynastic' period, supplementing these by remains which do not amount to actual records, and by traditions in which we can recognize elements of truth plentifully wrapped up with fiction.

For predynastic Egypt only one approximately fixed date has been suggested. In reconstructing its story we must go back to a dim 'once upon a time'—say 2,000 years or so before the dynastic era. Lower and Upper Egypt, the Delta area and the Nile basin between the Delta and the cataracts, had both been long occupied by people in no sense primitive, when the conquering people who ultimately made Egypt broke in upon them.

Makers of the Dynastic Civilization

THE newcomers possibly came from Punt, the modern Eritrea and Somaliland, having racial affinities with the modern Somalis, not with the negro or negroid Nubians—perhaps we must seek for their ultimate origin in the East, on the farther side of the Red Sea. Without, however, abandoning the view that Egypt may have suffered incursions from the East in the predynastic period, we must give weight to the latest evidence which seems to show that these 'dynastic' invaders penetrated southwards from the Delta. Their leader was by later generations called Horus, identified as the sky god whose symbol is the hawk. His great figure looms dim and tremendous through mists of confused legend and of countless years. We may, if we please, regard him as the inventor and originator of the idea and the institution of monarchy, the organized control of an obedient people by one man, accepted as wielding a divine authority; though more probably his personality is wholly mythical.

Although later traditions elaborated the Victories of Horus, no reliance can be placed upon them. We can hardly even guess plausibly how many decades or generations or centuries passed before the followers of Horus were masters of all Upper Egypt. But we can be sure that two distinct kingdoms, the North and the South, were definitely established some centuries before the dynastic era began.

At about this stage we come upon what may be reckoned as the definite date mentioned above. These early Egyptians, in the Delta, had carried their study of the heavenly bodies so far that they adopted a calendar which gave the year 365 days; and this invention may perhaps have been made in 4241 B.C.

They reckoned twelve months of thirty days with five holidays over. But they did not put in a leap year to correct the error of a quarter of a day; so that new year's day in the calendar shifted one day

from the astronomical date in four years, and the two did not coincide again till 365 leap years—1,460 years—had been missed. In the year A.D. 139 one such period, or 'Sothic cycle,' came to an end; and if we assume that the calendar had been in use for three cycles, this takes us back to the year named; though two cycles is as likely. Many centuries elapsed before the most advanced peoples adopted this early calendar, only correcting it by introducing the leap year.

Kings of Upper and Lower Egypt

It is probable that each of the two kingdoms of the North and of the South was a fusion of several minor kingdoms. Of persons and events we know next to nothing. We do know that their handicrafts belonged to the Age of Stone and were of an amazingly fine quality. Metal—copper—was only beginning to come into use; the tradition that the followers of Horus owed their victory to their metal-tipped weapons is probably a later fiction.

Centuries afterwards, under the Fifth Dynasty, lists of early kings were compiled, presumably from records of some sort; but they are names and nothing more. We are told nothing of what they did; nor do we learn more of them from the predynastic cemeteries which have been excavated. But we do know that

CRADLE LANDS OF THE WORLD'S EARLIEST ORGANIZED CIVILIZATIONS

It was in the valleys of the Nile and the Euphrates that advanced political societies first arose. This map gives the names and boundaries necessary for the understanding of their history down to 1580 B.C., but does not illustrate any single moment of that period. The nomadic Gutians and Kassites, for instance, were not pressing down into Babylonia from the indicated regions at the same time. For greater detail in each area, reference should be made to the maps under the study-chapters.

the first king of the South, who joined the two kingdoms under his single sway not later than 3400 B.C., was officially and traditionally the descendant and the representative on earth of the divine or deified Horus.

Until the ancient monuments began to yield their records to the research and interpretation of modern Egyptology, our knowledge of ancient Egypt was derived from the Hebrew scriptures, the traditions collected by the Greek inquirer, Herodotus of Halicarnassus, in the fifth century B.C. and the compilations of the Egyptian Manetho in the third century B.C., of which only fragments survive. That such information must diverge widely from the actual historical facts is a matter of course. What surprises the modern student is the extent to which it has been confirmed by the real contemporary monuments.

The king named Menes, who according to Manetho established the First Dynasty, was in actual fact one of the first of the long line of the Pharaohs; probably his legendary exploits are a combination of the historical accomplishments of the first three kings: the 'Scorpion,' Narmer and Aha Men (Menes), of whom we know from the early lists or from contemporary remains.

The northern kingdom was subjected not to the southern kingdom but to the southern king, who added the attributes of the northern king to his own and became Lord of the Two Kingdoms. He —or one of his immediate successors— refounded an ancient city, 'of the White Wall,' on the border, as a centre from which he could rule over both, though it was probably not until the Third Dynasty that it actually became the royal seat, and not until the Sixth that it was called the Egyptian equivalent of Memphis.

The North does not seem to have acquiesced in the change tamely, and the appearance of the Second Dynasty points to the passing of power to a northern family.

Organized Government 5,000 years ago

THE first two dynasties ruled for approximately 400 years. The second records no memorable doings, and ends with a fresh conquest from the South. The victor, Khasekhem, altered his name to Khasekhemui, married the heiress to the throne and became the progenitor of the Third Dynasty—the first Pharaoh of what is known as the Old Kingdom.

With Khasekhemui, provisionally dated about 2980 B.C., begins a series of mighty monarchs. His own statue has been found in his tomb in Upper Egypt at Hieraconpolis, the Hawk City, the center of the Horus cult.

The tomb of Khasekhemui is the first one to contain a complete chamber of hewn stone; his son Zeser, or Zoser, raised his entirely of stone, layer on layer, each layer smaller than the last, forming what is known as the first or 'step' pyramid. Sneferu, or Senefru, following Zeser after four reigns, filled up most of the terraces of his tomb at Medum, thus making a sloped instead of a terraced surface, though he did not add the completing cap. This is alternatively known as the first pyramid. After Sneferu came the great pyramid builders of the Fourth Dynasty.

The Egypt of which we have been speaking, Egypt before the third millennium, was a populous nation in an advanced stage of civilization. Of this the great tombs of the period at Abydos and elsewhere in central Egypt would be sufficient proof. Though we have to be satisfied with carven monuments, Egyptian scribes were already writing their records on papyrus also. Great progress was evidently made in the four centuries of Menes and his successors and this must be largely attributed to the intelligent activity of the centralized government.

The government itself was highly organized. The southern kings introduced in the north the system of government by districts, 'nomes,' which had long prevailed in the south—relics probably of the early division into small kingdoms. The Pharaoh was the center of all. Around him were the nobles, his personal friends and advisers. If he lived in magnificence and was laid in a magnificent tomb when he died, his life itself was strenuous enough. We see him leading his soldiers in battle, smiting the foe with his mace, cutting the first sod of a new canal, in his leisure time hunting game big and small.

The Pharaoh and his Duties

He is an active administrator. He has been trained from his youth to take a responsible part in his father's rule—probably has been his chief minister. His accession to the throne has been celebrated with pomp and ceremony, and in his thirtieth year he will hold a kind of jubilee coronation, the 'Sed' festival. It may be that originally actual abdication or something still more drastic took place when a king had reigned thirty years, but this is at best doubtful.

His nobles are buried in mortuary chambers under a mass of brickery, the 'mastabas' from which the Third and Fourth Dynasties perhaps developed the pyramids. More than 5,000 years ago the virtues for which the dead had desired to be remembered by future generations were recorded in epitaphs which show a lively sense of the responsibilities of greatness, and indicate a high standard of public spirit.

Like his father Zeser was a warrior; he subjugated the Nubians, to some distance above the First Cataract. He also built temples of stone, but discoveries seem to show these had a stone-building technique behind them, and to bear out the tradition that Neneter of the Second Dynasty was the first to use limestone for temple construction. The wealth of Egypt under Zeser is demonstrated by the immense amount of man power that could be absorbed in unremunerative labor without producing exhaustion.

The dynasty attained its zenith with its last monarch Sneferu. As a witness to his power he built at Dahshur (see map in Chap. 15) a second and nobler pyramid on a larger scale than his first—a complete one. He smote the Nubians. He brought the Sinaitic peninsula enduringly under the sway of the Pharaohs. He created a flotilla of great Nile boats and sent ships to Phoenicia to bring back cedar-wood from Lebanon. The nobles of his day built their mastabas not of brick but of stone; and he left a name which was held in high honor centuries after his death.

Sneferu left no son. His successor was Khufu, the founder of the Fourth Dynasty, from Middle Egypt. Of his deeds, and those of his son Khafra and his grandson Menkaura, we know for certain only that they built the three great pyramids at Gizeh, and almost certainly the Great Sphinx. They are familiar to us by the names of Cheops, Chephren and Mycerinus, from the pages of Herodotus, who gathered traditions about them which contain more fable than history.

It is scarcely conceivable that the Great Pyramids should have been built without the exercise of a grinding tyranny. The biggest, the pyramid of Khufu, covers 13 acres; it is computed to consist of 6,000,000 tons of stone, in 2½-ton blocks hewn to shape with an extraordinary exactitude of angle and surface.

That it took—as Herodotus says—100,000 men 20 years to build it is probable enough. Those huge blocks had to be hewn in the quarries beyond the Nile, brought over the river and dragged up an inclined plane to the site of the pyramid. The enormity of the toil is almost unimaginable. The strain, both economic and physical, must have been terrific. On the other hand, the organization which controlled such a vast mass of labor must have been amazingly efficient.

Khafra's pyramid was somewhat smaller than the other, with more apparent haste and less perfection in the workmanship. For both, the latest date is the twenty-ninth century. It is not surprising that, according to tradition, the land groaned under the burden, and the memory of the pyramid builders was held in abhorrence. The much smaller size of Menkaura's pyramid is evidence either of exhaustion or of the milder spirit of the Pharaoh.

The accession of the Fifth Dynasty would seem to mark the victory of priestly influence, and the supersession of the southern sky god Horus by the northern sun god Ra, or Re. Apparently the pharaonic theory of actual divine parentage was transferred to the offspring (according to the flesh) of Ra's high priest at On; the connexion at least is obvious in the personal names and the monumental buildings of the new dynasty.

Possibly something may be suspected of a phenomenon familiar in later ages,

EGYPTIAN RULERS WHO HAVE LEFT PROOFS OF THEIR WEALTH AND POWER

Very little is known of these two kings of the Fourth Dynasty, Khufu (2898-2875 B.C.) and Khafra (2867-2811 B.C.); yet the magnificence of their tombs demonstrates clearly that under them Egypt was at peace and extremely prosperous, and that the monarchy was absolute. For Khufu was the builder of the Great Pyramid at Gizeh, and Khafra of the larger of its two neighbors: works that could not even have been begun without an army of workers and vast resources.

Photos, Egypt Exploration Society and Mansell

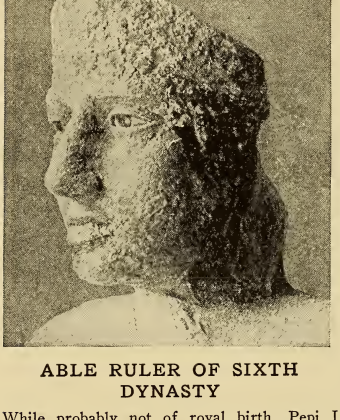
a blending of aristocratic and sacerdotal interests; for another departure from past custom is apparent. The great offices of state are no longer appropriated to the royal family; they become hereditary in the families of magnates. The germs of something analogous to medieval feudalism are beginning to appear.

USERKAF and Sahu-ra developed fleets on the Mediterranean and Red Seas, which sailed to Phoenicia and to Punt (Somaliland), and brought home the products of those regions—including slaves. Expeditions were sent to Nubia, and started the series of inscriptions above the First Cataract. The dynasty went on building pyramids, though by no means on the old scale. It could not afford to magnify itself after the old fashion, but was actively in search of new sources of wealth from commerce; while its dependence on the forces that had set it on the throne was raising the personal prestige of the nobility at the expense of that of the Pharaoh.

The policy of the Fifth Dynasty was carried out most effectively in the Sixth, in the fifty-three years' reign of Pepi I—if he actually reigned so long. He may have been a sort of Mayor of the Palace to his immediate predecessors, a powerful feudatory who succeeded to the throne unopposed. At any rate, he proved so adequate a ruler that two very young sons followed him, the second of whom, Pepi II, is credited with a reign of ninety-four years, the longest on record.

Pepi II began his reign as a child and ended it a centenarian, without having done anything in the interval to reestablish the royal authority. At his death we are probably in the twenty-fifth century. After it came the first of our two periods

of anarchy. The 'nomarchs,' lords of the nomes, the dukes and counts of the Old Kingdom, became so many petty princes, defying the nominal kings of two very shadowy dynasties; till a Ninth Dynasty followed by a Tenth—perhaps contemporaneous with the Eighth at Memphis—was set up at Heracleopolis



ABLE RULER OF SIXTH DYNASTY

While probably not of royal birth, Pepi I (2595-2542 B.C.) proved a far-seeing and capable monarch. He carried out a wise domestic policy and a vigorous and successful foreign policy, which together ensured a century of peace in Egypt.

From J. E. Quibell, Hierakonpolis

in Central Egypt by a group of nobles, who restored some local order at least, but only after irremediable damage had already been wrought. And the confusion was accentuated by an invasion of Asiatics from Syria.

Rise of Thebes & the Middle Kingdom

THE South, however, renounced allegiance to the Heracleopolitans; and after fierce wars a Theban house established the Eleventh Dynasty, the Middle Kingdom and the supremacy of Thebes—hitherto an unknown town, capital of a petty dukedom. Though it was temporarily interrupted by the Hyksos, this supremacy was to continue for more than a thousand years. We date the first of the line—all the Eleventh Dynasty pharaohs were Intefs or Mentuhoteps—at the middle of the twenty-second century.

Two Intefs and four Mentuhoteps ruled for a century and a half. The great families would seem to have ruled very much on their own responsibility in their own provinces, while the royal authority preserved the public peace, revived the policy of internal development, and in the time of Mentuhotep III warred against Libyans on the west, Nubians on the south and Sinaitic Semites. One noble was official Lord of the Marches in the south. Another was the Pharaoh's hereditary first minister; his house succeeded to the throne, probably not without opposition, on the death of Mentuhotep IV, inaugurating the Twelfth Dynasty of Amenemhets and Senusrets—of which the Greek form Sesostris is more familiar.

This dynasty ruled in power and splendor from about 2000 to 1788 B.C., if we accept the latest possible dates. Amenemhet I in his thirty years' reign fully established, not at first the old-time despotism, but the very effective supremacy of the crown, so long as it was worn by a strong and capable ruler. The succession was secured, with one exception, by the association of the crown prince with his father formally as joint king, during the father's life. The climax of power was attained under Senusret III, and of splendor under Amenemhet III. The southern border was definitely carried beyond the Second Cataract, and Egyptian armies raided Syria.

GREATER, however, than the renowned achievements of Senusret III in war were those of his son Amenemhet III in peace; for it was he who developed the regulation and distribution of the waters of the Nile in upper Egypt, and practically created a new highly productive province by transforming Lake Moeris in the Fayum into a vast reservoir for irrigation purposes.

The great dynasty had succeeded in once more centralizing the sovereignty, and reducing the personal power of the nobles, replacing it with the administrative authority of crown officials; so that government could carry on peacefully and automatically unless subjected to a strain which called for exceptional capacity in its head. But the line ended—

strangely enough for Egypt, with a queen —a few years after the death of the great Amenemhet. The new dynasty and its successor lacked the capacity of that which had passed; the second interregnum of anarchy began, with the kingship split into rival houses at Thebes and Itht-toui; and the whole system went to wreck with the Hyksos invasion, early in the eighteenth century.

WE have now followed the course of events in Egypt for sixteen hundred years, a period equal to that which has elapsed since the Romans were in Britain. Yet if we cast our eyes over the rest of the world to glean material for historical narrative, black darkness still meets us everywhere—with one exception. It is true that the archaeologist has recovered the material evidence of considerable cultures from sites all round the Mediterranean, especially in Crete and the Aegean, and has equated their development with Egyptian chronology; but of records that the historian can chronicle there is nothing. The interpretation of the discovered remains is, therefore, reserved for our study-chapters; Chapter 12 deals with the Mediterranean and notices the Hittites, while Chapter 13 does a like service for more backward Europe.

As for the Hittites, that mysterious people of Asia Minor whose power has only lately been revealed, their entry into world history is more properly a subject for the following Chronicle, and their polity is accordingly described in one of the chapters thereto annexed. But one or two definite events that may be referred to this period emerge from a study of their archives discovered at Boghaz Keui, and from the records of neighboring powers.. Thus the first king of whom we find mention—Pamba—lived about 2750 B.C., but he seems only to have ruled a petty state. It was not until about 2000 B.C. that Hattusil I made Hattusas the capital of a considerable

WARRIOR-KINGS WHO REVIVED THE POWER OF EGYPT

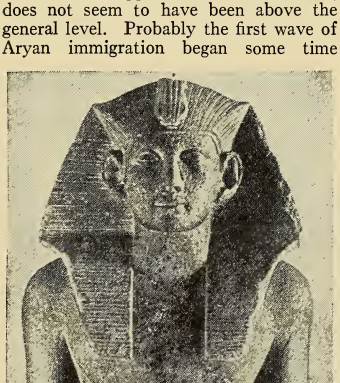
After three centuries of disruption (2430-2160 B.C.) Egypt recovered cohesion under a series of strong and beneficent rulers. It was Mentuhotep III (left; circa 2078 B.C.) who really united the country and made it strong within. Senusret I (1970-1935 B.C.) greatly enlarged his dominions by conquest in the upper Nile valley; and Senusret III (1887-1849 B.C.) was even more successful in his wars, as his victorious armies not only subjugated neighboring tribes but penetrated into Syria.

Photos, R. B. Fleming, Sir Flinders Petrie and W. F. Mansell

kingdom with its boundaries on the Mediterranean, while the sack of Babylon by the Hittites may be fixed at about 1926 B.C. (see below).

Dawn of History in Mesopotamia

For the civilizations of India and China a high antiquity has been claimed, but research does not support the claim. China was, no doubt, ahead of her neighbors in material culture, and something of the main lines of progress can be inferred from later knowledge; but the bulk of India, save for culture stations of Sumerian affinities, such as Mohenjo-Daro and Harappa in the far north-west, does not seem to have been above the general level. Probably the first wave of Aryan immigration began some time during our period. America we can safely assume to have been still in the hunting stage of barbarism, in spite of exaggerated estimates of the age of Inca and Maya civilizations that have sometimes acquired credence. The whole problem of the conditions attending the rise of civilization in these several areas is reviewed in Chapter 7.



BUILDER OF EGYPT'S PROSPERITY

One of the most enlightened of Egyptian rulers was Amenemhet III (1849-1801 B.C.). His strong, centralized government maintained peace, while his brilliantly conceived public works led to an increase in wealth.

Courtesy of Sir Flinders Petrie

The one exception of which the historian can take advantage is Mesopotamia. Here, during all these centuries, a civilization was developing, and records being made in an elaborate script, without any contact with Egypt other than cultural through the medium of trade; for chronology will not support a theory that an early king (Naram-Sin) met Menes in battle. It is posible, however, that some of the early predynastic invaders of Egypt may have originated in this area.

As in the Nile basin, the beginning of recorded history can hardly be dated earlier than the second half of the fourth millennium B.C., probably about its close; but from known conditions when the records begin, from earlier relics and from traditions, something of the preceding two thousand years may be inferred, though little can be positively affirmed.

The name Mesopotamia applies generally to the whole district lying between the rivers Tigris and Euphrates. The land about the two rivers between the modern Bagdad and the Persian Gulf may be distinguished as Babylonia; in those ancient days the rivers entered the gulf by separate mouths, the sea having probably since then receded some two hundred miles. Beyond the Tigris rose the mountains of Elam. West and south of the Euphrates spread the Syrian desert. West of the desert and the upper waters of the Euphrates plain came what were known later as Syria and Phoenicia; and beyond the mountains of the Taurus and Anti-Taurus, on the north and north-west, the highlands of Anatolia and Armenia.

Our beginnings, then, are in a Babylonia where as yet there is no Babylon. Sumerians predominated always in the southern portion, Sumer; Semites generally in the northern, Akkad. They were city dwellers and tillers of the soil; they exchanged produce; they had begun to work copper and make tools of copper; the Sumerians at least had developed a script on lines of their own.

Their cities make war on each other; one is now predominant, now another; tradition tells of dynasties at Kish in the

center, Akshak in the far north, Ur and Erech in the south, to say nothing of mythical predecessors. Their chiefs claim a dubious kingship over the rest. Most commonly the ascendancy rests with Kish and its apparently Semitic dynasties, until a century or so before or after 3000 B.C., when the historical contemporary records of the Sumerian city of Lagash begin with its king Ur-Nina.

The first monument we have, that known as the Stele of the Vultures, belongs to the reign of Ur-Nina's grandson Eannatum (about 2900 B.C.). Primarily, it commemorates the victory of Lagash over its neighbor Umma, but this warrior claimed also to have waged successful wars with other cities, Ur and Erech, to have smitten the Elamites—a people of ancient culture on the east—and to have vanquished Kish. The most distinguished of his successors at Lagash were Entemena and, after an interval, Urukagina, who was remarkable as an economic reformer. With him, however, the independence of Lagash ended. He was overthrown by the conqueror Lugal-zaggisi of Umma, who transferred his capital to Erech and claimed to have carried victorious arms from the lower sea (the Persian Gulf) to the upper (the Mediterranean). Then he in his turn was overthrown by Sargon of Agade, who, followed by his sons, set up a Semitic empire, which is traditionally dated in the twenty-ninth and twenty-eighth centuries.

NARAM-SIN

For Naram-Sin of Agade we have a portrait from the stele set up to commemorate his victory over the mountaineers in the lands beyond Tigris.
From the Louvre

The Assyrians of later ages looked back upon Sargon as their first national hero. As happened with so many other national heroes, legends gathered about the birth, youth and upbringing of Sharrukin or Sargon. Obviously he was not a king's son. Having achieved kingship, he reigned for fifty-five years, conquering all lands 'from the rising to the setting of the sun.' He crossed the eastern sea and smote the Elamites from the south. He marched to the western sea, subduing the Amorites (i.e. 'westerners'). He crossed that sea, though whether this means that he visited Cyprus we cannot be sure. He had begun his career of victory by overthrowing the mighty Lugal-zaggisi; he ended it with half of his empire more or less in revolt, but still unable to make head against him successfully.

Two sons, Rimush and Manishtusu, followed Sargon and maintained his empire. The next, the illustrious Naram-Sin, passed into tradition as a third son, but as he reigned at least thirty-eight years this scarcely seems likely.

The most valuable contemporary monument of Naram-Sin is that known as the Stele of Victory, which commemorates his triumph over Lulubu (trans-Tigris). It would seem that at an early period he overthrew nine armies and carried captive three kings, in chains; that he conquered Magan, probably on the Arabian shore of the Persian gulf; that Kish, forgetting that she owed her liberation from the Sumerian overlordship to Sargon, ungratefully headed a rebel confederacy against Naram-Sin, and paid the penalty for so doing. Naram-Sin also reasserted his authority in the west, and very possibly carried his arms into Anatolia and Armenia.

The Coming of the Gutians

Next came Shargalisharri, probably a son of Naram-Sin. The records of his reign are meagre, but he seems to have been troubled by the same sorts of revolt as his predecessors. At any rate, he too smote Elam on the east and the Amorites in the west.

We find him moreover at war with Gutium in the north-eastern mountains, whence a barbarian flood was presently to inundate Babylonia, though for the time it was held back. Probably the torrent overwhelmed Shargalisharri's successors, for the dynasty flickered out with a brief series of names and nothing more, and the kingship melted away among the 'hosts

of Guti which had no king,' as the dynastic lists put it.

The Gutian invasion and domination were very destructive of monuments and records, as of other things. In fact they had kings, but they probably left the local administration to run very much as it had run before under the local princes, who combined the functions of priest and ruler and bore the same title of 'patesi' which in the past they had borne except when the extended domination of a particular city, Kish, Ur or Erech, had entitled its patesi to claim the higher kingly title now appropriated by the Gutians.

Herald of a Sumerian Revival

But like other barbaric hordes the Gutians were not organizers of empire. The older culture was temporarily submerged but not destroyed; and presently there appears the distinguished figure of Gudea, patesi of Lagash—still a vassal of Gutium—under whose beneficent rule justice, prosperity, religion and the general concomitants of a wise government once more prevailed.

Our dates are very doubtful; but if we place Shargalisharri in the second half of the twenty-seventh century B.C., Gudea will come in the middle of the twenty-fifth. He prepared the way for Sumerian revival. Shortly after his time the Gutians were ejected from Babylonia, by a prince ruling at Erech; and then the ancient city of Ur once more becomes an imperial capital.

In the course of a long reign Dungi of Ur, whose father Ur-Engur (or Ur-Nammu) had established his supremacy in Sumer and Akkad, conquered Elam, extended his sway over upper Mesopotamia, and probably attached the flourishing Babylonian colony in Cappadocia to his empire. Yet the power of the dynasty hardly survived Dungi; it was overthrown by a disastrous Elamite raid; and the somewhat feeble sceptre passed for just two hundred years to an undistinguished dynasty at Isin, until Semitic conquerors, newcomers to the Two Rivers, set up the first ascendancy of Babylon.

Probably we must assume a prolonged and persistent penetration, rather than a conquest, by 'Amorites'—that is, Semites from the trans-Euphrates, west of Mesopotamia. At any rate at the close of the Isin dynasty we find its most prominent rivals at Larsa, whose lords bear Semitic names, and in the rising power of Babylon under foreign Semite rulers.

The Babylonian dynasty was established by Sumu-abum, in the days of Bur-Sin of Isin and Sumu-ilu of Larsa, probably about 2225 B.C. Half a century later, the Larsa dynasty was overthrown by the king of Elam; and some years afterwards, with the accession of his second son Rim-Sin—an Elamite though he bore a Semitic name—the struggle for supremacy was inaugurated by that ambitious chief. In the course of twenty years Rim-Sin gradually absorbed his neighbors' territories till he had conquered Isin itself, though once he suffered a reverse at the hands of Sin-muballit of Babylon. And then he met his match in the great Hammurabi, who was the son of Sin-muballit.

Hammurabi and his Triumphs

In his first years Hammurabi dealt firmly with Rim-Sin, who had to surrender most of his acquisitions to that Babylonian Alfred the Great. In the forty-two years of his reign he established a vast and well-ordered empire; but his greatness lies in the fact that his aim was not expansion by military exploits so much as unification by peaceful organization.

After he had defeated and bridled the elderly aggressor of Larsa, we hear little of war and battle for many years; but we have indications that his authority was accepted all over Mesopotamia and that only small bodies of troops were needed for its enforcement. At the close of his reign or near it he had to suppress Rim-Sin finally and thoroughly, and to send expeditions to Elam. He must have been involved in other military activities, of which perhaps we have a glimpse in the biblical story of Abraham—if, as seems not unlikely, Amraphel of Shinar stands for Hammurabi.

His grand work, however, was in the system of administration which culminated in the famous Code. The laws of Hammurabi were not his own invention; they are a codification, shaping into one harmonious whole a multitude of laws and customs already in existence, and no doubt modifying them. But the codifi-

cation is an epoch in the science of government.

A slow disintegration set in after Hammurabi was dead. The dynasty lost grip. Among the marshes that were steadily encroaching on the head of the Persian Gulf there grew up a 'Kingdom of the Sea Country' which was in frequent conflict with the successors of the great king. It lay on the lower Tigris, since the Babylonians tried to flood it out by damming that river; but one of its kings, Iluma-ilu, came near to obtaining control of the whole country. The mountains on the east were full of tribesmen who were more than ready to take advantage of any signs of military weakness among the plain-dwellers. Behind the mountains of the west were surging the hordes of the Hatti or Hittites.

Some century and a half after Hammurabi's decease, the dissolution of the dynasty was brought about by the devastating Hittite raid already mentioned, which left the power of Babylon shattered and helpless. The next apparently indisputable fact is the establishment of a Kassite dynasty at Babylon by the conqueror Gandash about the middle of the eighteenth century—a date not far removed from the latest assigned to the Hyksos invasion of Egypt, in the earlier half of that century.

Dark Age in Egypt and Babylonia

There would seem to have been an interval of nearly two hundred years between the fall of the Babylonian dynasty and the Kassite conquest; an interval filled in only by the names of rulers in the Sea Country, and at Ashur (in Assyria), but without any record of events. On this basis the accepted date for Hammurabi is 2123-2080 B.C. Some authorities, however, will admit no gap, and date Hammurabi 1944-1901, the date 1746 B.C. for Gandash being practically fixed. Almost certainly this is too low, but recent evidence seems to date the beginning of the Babylonian dynasty to 2169 B.C.—which would place Hammurabi's accession in about 2067. Until further confirmation, however, it is safer to follow the accepted chronology.

For some centuries following the close of the Twelfth Dynasty in Egypt and of the Hammurabi Dynasty in Babylon, the chronicle of both regions is involved in obscurity. The mists will rise again in Egypt at a date of which we are assured within a year or two—1580 B.C.—with the expulsion of the Hyksos and the founding of the Egyptian Empire; in the Euphratic region they are hardly dispersing till about a century later.

The Kassite conquerors were rude barbarians from the eastern mountains. Though their royal family ruled for nearly six hundred years their tribes never formed more than a fraction of the population into which they were absorbed. Under their rule, Babylon by slow degrees recovered something of her old ascendancy and claimed the old high-sounding titles.

The Kingdom of the Sea Country faded out and was absorbed; Ashur (Assyria), on the upper Tigris, paid homage to Babylon which was little more than formal. In upper Mesopotamia the independent power of Mitanni appears firmly established when the mists rise; its sway never extended over the Amorites, the trans-Euphrates Syrians and Phoenicians of the west. The Hittites had not followed up the devastating incursion which shattered the old Babylonian dynasty; it was in the coming centuries that they were to make their bid for rank among the civilized powers of the ancient world.

Egypt invaded by Foreigners

For the Nile Region the later Egyptian compilers enumerate five dynasties between the Twelfth and the Eighteenth, which founded the Empire: three legitimate and two foreign, the latter being counted as the Fifteenth and Sixteenth. On the latest-date calculation, they are crowded into 208 years.

The points which seem clear are these. The weak pharaohs of the thirteenth dynasty were ejected from the Delta by foreign invaders; but they and their successors were permitted to maintain at least a show of authority in Upper Egypt, though they eventually became tributaries of the Hyksos.

The Hyksos were certainly of Semitic speech; presumably they were a horde or confederation of pastoral nomads from Syria, of whom the Israelities or Hebrews may just possibly have been a section

that either before or after the invasion settled in the Delta, but was retained in its settlement at the time of the expulsion. The one novelty that Egypt owed to the invaders—for future use—was the war-horse and the war-chariot. Their domination was wholly destructive, though their later monarchs found themselves unable to resist the immemorial influences of the country. Tradition, of course, denounced them as infidels, brutal tyrants and oppressors.

The much later Jewish identification of the Hyksos as a whole with the Hebrew tribes is untenable, though we may recognize an intimate legendary connection between the sojourn in Egypt and the Hyksos occupation. Uncertain also is the theory that the name is to be translated 'shepherd kings,' which is appropriate enough if they were a horde of pastoral nomads, but may very possibly be only an ingenious etymological error. 'Princes of the Deserts'—in other words, Beduins—is a more probable interpretation.

The Hyksos and their alien Rule

The Hyksos formed a great armed camp, garrison or fortress at Avaris —a position on the east of the Delta which cannot be exactly identified—so that they might dominate Egypt from it and at the same time control their Syrian empire or confederacy, concerning which we have no further information. Their mightiest ruler was Khian, who took the title which means 'Embracer of Territories,' besides a regular pharaonic throne name. Under him and his successors there was probably no independent Egypt in the south. Relics of him are found as far afield as Crete and Babylonia, though of a kind which suggests that they may very well have been merely spoils carried off thither at a much later date.

Towards the close of the seventeenth century, the Seventeenth Dynasty was reigning in Upper Egypt at Thebes, which had probably regained a measure of independence under Sekenenra I, but was still vassal to the Hyksos over-lord Apopi III in the Delta. Apopi, says tradition, sent word that he was annoyed by the roaring of the hippopotami in the realms of the king Sekenenra III. No doubt the envoy spake a parable. Sekenenra took alarm; he revolted, and the revolt developed into a war of liberation.

Egypt's War of Liberation

Patriotism rallied to the daring rebel, and when he himself fell fighting—as testified by the wounds on the dead man's skull, which is preserved—it did not desert his young sons. Though tradition describes the war as a long one, its conclusion was achieved within twenty years by the third and youngest of them, the still youthful Aahmes. In the final stage, Memphis had been captured and the foreigners were besieged for three years in Avaris.

It is significant of the difficulties under which the patriots labored that, during the prolonged siege, the Nubians in the south revolted in conjunction with some Egyptian nobles. So grave was the peril that the young king left the siege in person to lead an expedition against the rebels. His success was swift and complete; he returned to the siege with all a victor's prestige; and Avaris fell. The Hyksos army was driven over the border or cut to pieces, and the Hyksos vanished from the land they had plagued so long.

Egypt was once more free, and with the establishment of the Eighteenth Dynasty a new era commences. In Mesopotamia, however, the Kassites were still ruling; obscurity besets the records on every hand, and Assyria had not yet felt her power.

THE RISE OF ORDERED CIVILIZATIONS

THE CLASH OF CULTURES AND ITS FRUITFUL STIMULUS TO THE PROGRESS OF HUMAN SOCIETY

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THE great majority of human societies owe their continuous existence to a mode of life and a system of social institutions which are stable and very hard to change. Occasionally it is possible to discover when and how such habits and customs originated; but usually all that can be said, either by the people who hold them or by scientific enquirers, is that as far back as knowledge or memory reaches things have been so; with the further opinion on the part of the people themselves that they are best left 'as they have always been.' That is to say, in such societies adjustment has been reached between available resources and realized needs; if discomfort or want is felt, it is accepted as inevitable, and is frequently explained as a retribution for some breach or other of the established order, not as the result of the people's own failure to adjust their behavior to their actual circumstances.

While the quality and behavior of simple societies thus apparently tend to be stable, their size, and the number of tribes or other units which occupy a natural region, seem also to be constant, in the absence of some disturbing factor. But in the reasons for this Man differs from other living things, which breed in the wild state without restraint and are restricted to their actual numbers by a 'struggle for existence' in which a large proportion of each brood is destroyed prematurely. In the simpler human societies overpopulation is avoided more deliberately, either by postponement of marriage and other forms of restraint or by more or less systematic infanticide.

In societies thus accommodated to their regional surroundings there is no more place for a 'great man' than for a 'great ape' or a 'king lion,' to reform the specific behavior of his kind and start them on a new phase of well-being; and it is difficult to see how such equilibrium can change, in the absence of some external cause of disturbance.

On the other hand migrations of peoples do occur, both on minute and on very extensive scales. And since such migrations of one community into the region occupied by another are among the most obvious, and also the most common, causes of the dislocation of habitual equilibrium, it is necessary to ascertain both the reasons for such movements and the opportunities for them, before enquiring into their results in the migrating groups themselves, and into their effects on the societies among which such immigrants are intruded.

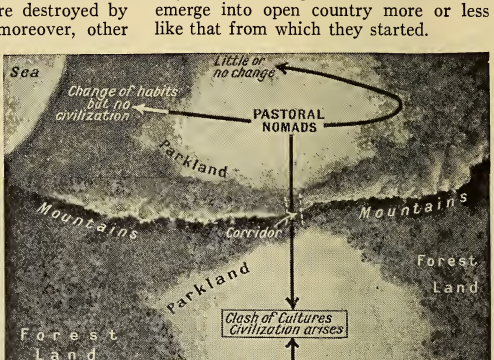
In the first place the geographical distribution of climate and vegetation is not fixed; and although its changes are for the most part very gradual, they are occasionally rapid and far-reaching. Such changes may be progressive for long periods, like the advance or retreat of an ice age over North America or northwestern Europe; or they may oscillate through a comparatively short cycle of phases, like the spells of hotter or cooler, wetter or drier summers, which may be recognized through the statistics of wheat production since such records were first made.

Obviously such oscillations affect most appreciably those areas where a small change, in the rainfall for instance, makes all the difference between pasturable grassland and mere desert; and as the wholesale destruction of plant life by a very few dry seasons may take a long while to repair, it is among the pastoral peoples

on such grasslands that the effects of climatic changes produce the most violent disturbances, seeing that they are at all times on the move between summer and winter grazing grounds and have least difficulty in shifting themselves and their flocks and herds to districts less severely affected by the drought.

But the grasslands, vast as they are, have their limits, and these limits to easy progress are set less by mountain barriers than by belts of forest where the cattle stray out of sight and are destroyed by beasts of prey; where, moreover, other men live, hunters to whom the nomad's flocks are easy game and farmers who defend their crops against grazing animals as vigorously as the shepherd his flock against beasts of prey. But in this border warfare the superior mobility and closer discipline and co-operation of the pastorals, and consequently their greater ability to concentrate for attack as well as for mutual defence, gives the intruders decisive advantage. Defeated at one point, they can retire into open country where the woodsman cannot pursue; victorious, they add the surviving inhabitants to their establishment and domesticate—that is to say, enslave—them as 'hewers of wood and drawers of water,' and above all, as growers of those vegetable luxuries, 'the onions, the leeks and the cucumbers,' which almost reconciled the pastoral Israelites to sojourn in 'Egyptian bondage.'

The extent to which pastoral people in the course of this kind of migration are able to penetrate the parkland fringe of a forest belt obviously varies, and is determined by local circumstances, examples of which we shall have to consider. As long as intrusion is marginal, and the way remains open for withdrawal on to the grassland whence the intruders came —as has happened on many occasions— the results are more significant to the conquered than to the invaders, though the latter can hardly escape some degree of transformation in habits of life and in outlook. Two other cases, however, are of more profound importance: in which, namely, the intruders either become permanently and irrevocably involved in their new surroundings, and habituated to them; or else make their way clean through the woodland and emerge into open country more or less like that from which they started.



WHAT MAY HAPPEN TO PASTORAL NOMADS

Somewhere behind every outbreak of civilization one may suspect the irruption of comparatively nomadic folk into a settled area of different culture. This is a purely schematic exposition of the three fates that may befall the inhabitants of a grassland region who have started on their wanderings.

Examples of the first alternative are the numerous immigrations of originally pastoral peoples from the Eurasian steppe into the forested European peninsula, beyond which lies nothing but the Atlantic coast-line, or from the margin of the Arabian desert into the 'good land this side Jordan' which fronts on to the Mediterranean; of the second, the coming of the Magyars into the Hungarian plain through the Moravian Gate and the passes of the Carpathian range, the coming of the Turks into Asia Minor, and (on a far more momentous scale) the coming of the Aryan-speaking peoples from the Eurasian steppe into the Persian plateau and

Mesopotamia, and into northern India.

It hardly needs to be said that such an avenue, once disclosed, through the whole breadth of an uncongenial or obstructed region into a 'good land' beyond it, does not easily pass out of use; and we shall see how such habitual routes of migration have been among the most significant features of the Earth's surface, from the historical point of view.

Accordingly the fate of any folk who have traversed such an avenue, whether as the first pioneers or afterwards, is complicated by the subsequent arrival of other peoples along the same track, competent to displace and disorganize them as they had disturbed whatever inhabitants they found already there; with the result that the place of origin of a new type of civilization has usually been at the farther end of one of these great avenues. Conspicuous examples were the first historic cultures of Egypt, India and China; and the course of events on the land-bridge between North and South America has probably been essentially similar.

For it is in regions of stress and collision of this kind, and on occasions of such trans-migration into unfamiliar surroundings, that the close tribal organization and intimately communal behavior of simple societies, within which the individual counts for almost as little as the individual ant or bee, or the bison or horse in a natural herd of its own kind, undergoes such dislocation that the men who compose it have literally to 'think for themselves' because they may at any moment have to fend for themselves, irrespective of the customs or the needs of the rest.

Familiar examples of such crises of disorganization, of the emergence of whole generations of intensely individualized, keenly self-conscious personalities, and of the origination of new modes of life and thought under their leadership, are the periods celebrated in the Homeric poems of early Greece, in the epic literature of the Teutonic migration period, and in the sagas of the Viking colonization of Iceland. The attempt, on the other hand, to conserve the 'custom of the elders' among an immigrant folk, in face of the temptation to 'learn the works' of the previous occupants of the country, and become acclimatized as they had been, is the tragedy of the Chosen People in the Promised Land of Palestine. And we shall see that, with this clue to their meaning, the earlier literatures of Babylonia, Persia and India become an eloquent autobiography of similar experiences in those lands, which were equally regions of immigration.

In all such periods of crisis there are involved obviously three principal factors: the geographical conditions of the region, the inherited qualities and initial behavior of the new-comers, and the breed and civilization of any indigenous people who survive conquest. Each of these has been different in every cradle of new culture; and the result of their interaction has also been different, though in some respects more closely analogous than might have been expected. What we have now, therefore, to do is to survey in turn the principal avenues of human movement, and to describe the results of the clash of cultures at each one of them.

How Civilization Dawned in China

THE great grasslands of the Old World are, or more strictly have recently been, five: Mongolia, the Tibetan plateau, the Eurasian steppe, Arabia and North Africa. Each has long been a reservoir of a separate kind of pastoral folk, and the peculiarities of each of these breeds and their respective cultures are sufficiently well marked to justify the belief that each was long isolated by natural barriers of structure or vegetation, and that it was only rather recently that the principal avenues of egress from them were disclosed.

The Mongolian region occupies the northern and less elevated half of the lofty continental core of Asia. It has three groups of exits, to the west, to the north and to the east, each into a quite different neighborhood.

Westward the long corridor of Zungaria, still partially fertile, and the more rugged and abrupt passes north and south of the Alai Tagh, from eastern Turkistan to western, all open on to eastern sections of the Eurasian steppe. Northward, the numerous headwaters of the Yenesei and Amur—and, between these, of the Lena far to the north-east —intersect a broad belt of mountainous

woodland, wherein emigrants from the Mongolian grasslands inevitably lost their primitive pastoralism and accommodated themselves to the forest life of hunters. South of the Khingan Mountains, which separate eastern Mongolia from Manchuria, begins a third, or eastern group of gateways. Their extent is easily recognizable by the course of the Great Wall of China, Man's futile attempt to block them. Here violent west winds, and that inexhaustible supply of fine dust which they have brought off the surface of Mongolia to form the thick 'loess' deposit smothering all this region, restrict the spread of forest and expose the lowlands of North China from Peking to the lower Yang-tse-Kiang to repeated incursions of Mongolian hordes, made mobile by their possession of horse and camel, as well as other domesticated animals.

Though native historians of China have attempted to compile local traditions of earlier events into a continuous chronicle, history opens in this region with the arrival of new conquerors, the Chou Dynasty, probably in the twelfth century B.C. Their leader, Wan Wang, appears first as a warden of the western marches against other raiders from the interior, then, with the help of these 'men of the west,' as the popular liberator from oppressive Chinese overlords, the Yin Dynasty, and the organizer of a confederation of territorial duchies, responsible to himself as 'Son of Heaven' and high priest of the whole people. But this was not the beginning of the Chinese civilization; it was a political reform of a people and a state already civilized. Chinese writing, for example, is found on works of art attributed to the Yin dynasty (1766-1122 B.C.), which the Chous overthrew, and its invention, together with that of boats, wheeled carts, silk weaving, composite wind instruments and a system of measures, is attributed by Chinese authors to an epoch about a thousand years earlier than the coming of the Yins. To the same period are assigned an early expansion far beyond the primary region round Singan, and also wars with barbarous Hun-yu folk on the Mongolian frontier, reputed ancestors of the Huns.

The Chou Dynasty lasted till about 250 B.C., but the great work of its founders was less permanent. The Son of Heaven himself was not always an

CRADLE OF CHINA'S IMMEMORIAL CULTURE

The historic three-fold division of China is here indicated. North China is a region of fertile loess, blown from the plains of Mongolia; Central China (the basin of the Yang-tse-Kiang), of alluvium; South China, of forest now reclaimed by colonists from the other two.

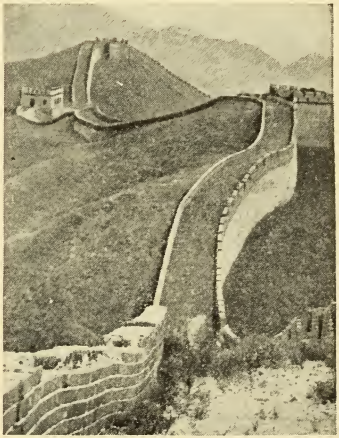
able ruler, and in border wars of expansion against Tatars to the westward, or the Miao-tze aboriginals of the south, frontier provinces and their governors counted far more than their overlord in the Wei valley. What kept the rickety empire together was the deep-seated loyalty of the mass of the population. And this loyalty, rooted in traditional observance—'we have to do as our ancestors did: they obeyed, so we are loyal'—was reinforced also by the recurrent dangers of a common enemy, the Hiung-nu barbarians or the rival T'so state which grew up in the Yang-tse valley as the result of Chinese colonization there.

The typical incidents of early Chinese history are frequently repeated. A local magnate, sometimes from a frontier province and skilled in war, sometimes an able administrator nearer the center, makes use of popular discontent with the central administration, seizes Loyang or if possible Singan, staves off an invasion of Hiung-nu from Mongolia, reconstitutes the feudal confederation of provinces north of the Yang-tse and occasionally extends his suzerainty south of it. After various intervals the dynasty so founded becomes demoralized, and gives place to a new rebel, defender and reformer; sometimes also throwing up a protest, such as that of Confucius against moral as well as political abuses.

But meanwhile the life of the densely populated provinces goes on. Wheat and millet, supplemented locally by barley and other grains, and garden crops, are the basis of subsistence, adequate except in time of flood or drought to maintain close-knit family communities, regulated within by the law of filial piety and adjusted to each other by that of consideration for others. Only when Tatar influence predominates, as it does under a weak overlord, is this morality contested by the raider's creed of 'each for himself'; in ordinary times it reduces local administration to the adjustment of a few hard cases and the relief of accidental distress, and makes centralized government superfluous except when the Hiung-nu are on the frontier or the Yellow River breaks bank.

But such a mode of existence, adequate and stable as it has always appeared to the Chinese themselves, barely scratches the surface of China, in exploitation of its natural resources, coal, iron and other minerals, its upland water power or its fertility for other crops than the traditional foodstuffs and pasture. Consequently when the sea, instead of an impassable no-man's-land, came to be a highway for distant nations already industrialized and alert for markets, the traditional culture of North China found itself ill-equipped either to resist or to reform itself.

Down to this point attention has been confined to the region of North China, the basin of the Hwang-ho and its tributaries—loess-land or alluvium derived from it, bearing wheat and millet rather than rice and exposed to immigration from the northern, Mongolian half of the Asiatic core. But this is only one half of the story. South of the Mongolian



LOOKING ALONG THE GREAT WALL, CHINA'S BARRIER AGAINST THE MONGOLS

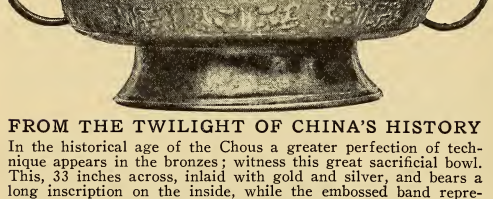
Who the nomads were against whom North China had to guard itself is clearly shown by the course of the Great Wall. It was started by Shih Hwang Ti, who came to the throne in 221 B.C.; but just as it was not finished until many centuries later, so the need that prompted its construction goes back into the unrecorded past. This view shows it where it winds up the mountain side after crossing the Nankow Pass north-west of Peking.

plateau lies the much loftier grassland region of Tibet, of about equal extent and triangular like Mongolia, with a westward avenue from Kashgar through Ferghana on to the Eurasian steppe beyond Tashkent and Samarkand, and with greater difficulty over the Pamirs to the upper valley of the Oxus.

Outwards from this dry plateau of Tibet, towards the monsoon-watered regions to south and east, pastoral folk have long been drifting lengthways along the upland grazing grounds, between the longitudinal valleys which are filled with dense forest and jungle. But in the highlands overlooking Sze-chuen the main stream of the Yang-tse has barred this movement lengthways. When the uplands in due course become congested districts, their occupants are obliged to descend; and in the fertile red soil of Sze-chuen, so charged with moisture that it can be terraced and irrigated locally to the very hilltops, they have changed their mode of life and become settled cultivators of hillside shrubs, aromatic or stimulant, for whose produce—oranges, rhubarb, opium and other drugs—there is immemorial and unlimited demand among the milk-fed pastorals of the regions behind them. Eventually, through similar exploitation of the lower basin, another hillside shrub, the tea plant, attained paramount importance in this kind.

A greater economic revolution came when settlement outwards and downwards from the high pastures reached the fens along the water courses, and either discovered rice for itself, or adopted it from jungle aborigines and improved its cultivation by regulating the watercourses and redistributing their water among the paddy-fields.

On a far larger scale, but with the same tell-tale association of rice-fields on the alluvium, with tea plantations and other luxury crops such as ginger, orange and citron on the foothills, the lower basin of the Yang-tse with its tributaries became the regional provinces of Hu-peh, Hu-nan and Kiang-si; and in time the delta regions of Kiang-su were reclaimed in the same way. It is in Kiang-si that the vast deposit of china clay has supplemented the tea-and-rice culture with an article of daily use, the food bowl of procelain superseding wooden vessels, which has made 'china' a household word for the finer sorts of earthenware.



FROM THE TWILIGHT OF CHINA'S HISTORY

In the historical age of the Chous a greater perfection of technique appears in the bronzes; witness this great sacrificial bowl. This, 33 inches across, inlaid with gold and silver, and bears a long inscription on the inside, while the embossed band represents the orgre T'ao T'ieh.

From British and V. and A. Museum

The history of China is still, what it has always been, the history of the resistance of a 'Middle Kingdom' to aggression from without. Apart from this danger, and the long sequence of attempts to repel it, the Chinese are indeed in the enviable position of having no history. Only in the vaguest tradition have we glimpses of a China in which the rivers wandered unrestrained and there were no fields of wheat and millet, no mulberries or silkworms, no wheeled carts, no Minister of Education or of Music in the cabinet.

India and Its Aryan Invaders

ONE of the contrasts between the history of China and that of India results from the differences in the method of inquiry. Both the indigenous culture of China and the civilization of its invaders are in most respects isolated facts; comparison is only possible with kindred peoples in very much later periods, such as the aborigines of Yun-nan, described by modern travellers, and the medieval Tatars. The aborigines of India similarly have their modern counterpart only in the jungle-folk and other survivors in secluded districts. But the Aryan-speaking invaders had beliefs, institutions and a mode of life that can be recognized

in other regions through the fact that their speech belongs to a widely distributed family of languages, possessing in common many words for natural objects, instruments of daily use, practices and ideas underlying them.

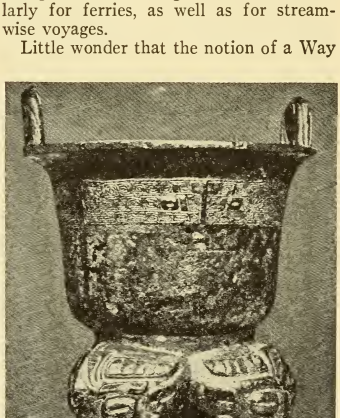
From the study of these it has been possible not only to reconstruct in outline the mode of life which was once enjoyed by the ancestors of all these peoples under similar geographical conditions, but even to detect, by comparison of the divergent vocabularies of the derivative languages of later times, the subsequent experiences of each group of Aryan-speaking folk, in the course of their movements through regions of other physique into the countries where those derivative languages were spoken and may be studied in their literatures or in everyday speech. By this method of comparative philology, therefore, discovery passes far beyond the periods represented by the earliest extant documents, and tests popular traditions by the forms of the very words in which they have been preserved.

It may be accepted, for example, as certain, that all Aryan-speaking peoples, whatever their racial origins, have received their language and large elements of their culture from tribally organized folk, originally of nomad-pastoral habits, occupying once a wide grassland region remote from the sea. They were in possession of the horse, as well as oxen, sheep and goats, and consequently were well equipped for hunting and for aggression, as well as for the care of flocks and herds. From their possession of a primitive vocabulary for the simpler processes of cereal agriculture, and also for certain forest trees, it is inferred that they ranged widely into the parkland which bordered their grassland cradle, and utilized its resources of timber for dwellings and also for wheeled carts.

The latter gave them ampler facilities, not only for transporting their families, but for conserving and elaborating numerous domestic arts which the women of merely horse-riding nomads have to forego by reason of the difficulties of transporting household gear. For the same reason it was possible to penetrate farther than such nomads usually can into forest country, without disorganizing the close-knit structure of their tribes and families.

From this exploration further effects followed. On open grassland there is good going in all directions, at any season when men wish to move about at all. But in parkland and forest, especially in rolling or hill country, such traveling is restricted to routes of least difficulty. Such roads have in the first instance to be cleared; then traffic itself defines and consolidates them, but also necessitates repairs; streams, too, must be crossed by paved fords, or (where timber is available) by bridges, and these also were provided very early. The great rivers of the grassland itself gave occasion similarly for ferries, as well as for streamwise voyages.

Little wonder that the notion of a Way



BRONZE-WORK CAST IN THE TIME OF THE YIN DYNASTY

Most relics from the age of the Yins are bronzes, and their finish argues an already mature civilization. Above is a vessel for steaming sacrificial herbs; the base is hollow and separated from the upper portion by a colander, so that when placed over a fire steam from the water below may penetrate to the herbs above.

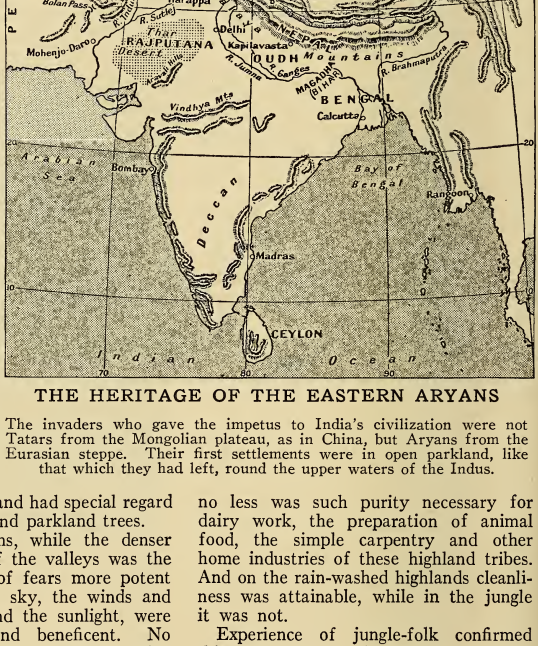
From the Victoria and Albert Museum, South Kensington

beset with various difficulties, leading to an objective only dimly conceived and depending at every step on decisions and choices which only knowledge could rightly guide, became the symbol of moral progress and guidance among these people, as their tribal behavior ever encountered new problems of conduct during their actual journeys. What the 'sojourn in the wilderness' was for the early Israelites, the Way through mountain and forest became for these Aryan wanderers.

Primitive words and phrases for parkland life and observances, in respect of tree cutting and road making, reveal early Aryan-speaking folk as careful foresters as well as pastorals and cultivators. Like the less equipped emigrants from the Tibetan highland into south-eastern Asia—and, even more conspicuously, from the necessary aversion of carriage folk for boggy country—they traveled high, used hill-tops as landmarks and holy places, regarded watercourses rather than ridges as their natural boundaries, and had special regard for certain upland and parkland trees.

In such conditions, while the denser forest and jungle of the valleys was the haunt of foes and of fears more potent still, the peaks, the sky, the winds and clouds, the dawn and the sunlight, were beings congenial and beneficent. No less powerful and kindly, though capable of dire devastation, was fire, the forester's first aid, which skill and luck combined to elicit by rubbing one piece of wood upon another till friction engendered flame.

This creative act, so amazing, so essential, so responsible, became a central mystery and a symbol of social coherence; men 'of the same fire' were bound by a tie as indissoluble as is due to those totemic animals and plants which designate human relationships in many primitive communities, especially among hunting peoples. For the creation of fire by these methods scrupulous cleanliness is essential; moisture, grease, dust and soil are equally fatal to achievement; and



THE HERITAGE OF THE EASTERN ARYANS

The invaders who gave the impetus to India's civilization were not Tatars from the Mongolian plateau, as in China, but Aryans from the Eurasian steppe. Their first settlements were in open parkland, like that which they had left, round the upper waters of the Indus.

no less was such purity necessary for dairy work, the preparation of animal food, the simple carpentry and other home industries of these highland tribes. And on the rain-washed highlands cleanliness was attainable, while in the jungle it was not.

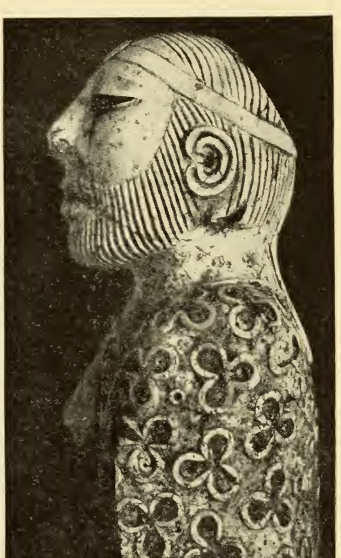
Experience of jungle-folk confirmed this, and perhaps offered a too obvious explanation for the darker and darker complexions encountered by those people of Aryan traditions who wandered farthest south. Moreover, there seems little reason to doubt that these migra-

tory pastorals from the Eurasian grassland were themselves predominantly if not typically blonde. Whatever the motive may have been—tribal exclusiveness, cleanly habits or mere color-bar as it is now the fashion to call it—the Aryan civilization inculcated an exclusive race consciousness which was an important factor in the maintenance of its observances amid diverse and unpropitious surroundings.

With the fortunes of those Aryan-speaking tribes who spread westward, we are only concerned here in so far as they offer comparisons with the Aryan immigrants into India. These, in their transit through the mountain zone, necessarily experienced far more intensely than others the discipline of the highland forests, and descended more compactly organized, and dominated by notions more precise and austere, into a region more profoundly uncongenial than the destination of any other such adventurers.

Of their actual transit it is unlikely that material evidence will ever be recovered. The wooden instruments and constructions of a woodland people perish easily, and the very low status of the potter in all Indian communities indicates that his art was not among those practised by his conquerors. The practice of cremation, too, has deprived us of the priceless information which tomb furniture supplies among peoples who are sedentary and bury their dead. Only the reverent accuracy with which the songs, the traditions, the wisdom and morality of bygone times were treasured in these exclusive and stable societies has preserved in outline their mode of life and the story of their doings.

From the moment, however, of their descent into the foothills and upper plains, and their establishment of permanent centers of administration maintained and adorned by the labor and craftsmanship of their native subjects, archaeological testimony is possible, and this is now slowly being discovered. Pre-Aryan India was by no means all jungle and barbarism; the north seems to have had intermittent communication—commercial, at all events—with the Sumerian culture of the Euphrates-Tigris delta. In the south a large area in the Deccan plateau practiced iron-working, made fine pottery and built tombs with large slabs of stone, earlier than there is any reason to believe that Aryan culture penetrated thither; nor were any of these arts within the Aryan ken. The coming of the Aryans was, then, a real clash of cultures, with all that such a tragedy implies; and Indian history is the sequel to this crisis.



EVIDENCE FOR CULTURAL CONTACT BETWEEN INDIA AND BABYLONIA

Mohenjo-Daro and Harappa are the two Indo-Sumerian sites hitherto excavated. From the former came the splendid limestone statue, decorated with white plaster and red ochre.

Courtesy of Sir John Marshall, Director General of Archaeology in India

The main ways of descent from the highlands were probably through the western passes, Bolan, Khyber, Malakand, into the Punjab, though some early descriptions have been identified with

mid-Himalayan routes. The Aryavartas, or districts of Aryan-speaking settlement, which resulted lay in two groups, an earlier one among the Five Rivers tributary to the Indus, another rather later among the Himalayan tributaries of the Ganges. Between these two groups, as their territories expanded, there was heroic warfare, commemorated in the Mahabharata epic.

Naturally the strategical and commercial advantages of a site at the confluence of each pair of frontier rivers determined the position of the capital of each region; behind this lay the cornland and cattle-ranches, and above that the hills with their timber, minerals and holy lakes and springs. Across the Jumna and Sutlej lay a great region too dry for Aryan exploitation; beyond this again another world with hill country and forests of its own, along the Aravali and Vindhya ranges, inhabited by men of darker color and alien speech and habits. Eastward, too, Aryan expansion was checked by collision with a quite different set of intruders through east Himalayan passes, Mongoloid exploiters of the Brahmaputra and lower Ganges.

It seems probable that Aryan immigration into India may have begun about 2500 B.C. It was, however, a long process, for even in hymns of the Rig-Veda, which may date from about 1200 B.C., Aryan territories were still limited southward by the physical barriers of Rajputana and eastward by the upper Ganges.

Of the former occupants of the country it is difficult to form a clear notion. The Aryan conquerors called them Dasyu, and early poems described them as black-skinned, flat-nosed, unclean people 'who do not perform sacrifices, nor believe anything,' but inherited from their mothers and were ruled by them. But, in the same texts, they have fortresses of stone, governed by powerful kings of great wealth and magical skill.

Physically they may be identified with the Dravidian type, widespread in modern India, and the presence of Dravidian words even in Vedic texts, and more commonly in classical Sanskrit, confirms this. In time, too, snake worship, demon worship and other religious and magical practices, alien to Aryan tradition and belief, were tolerated in Aryan communities. But the older population was itself already composite, and the Dravidian culture represents probably the effects of some previous immigration on aborigi-

BATHROOM OF A PRIVATE HOUSE IN PRE-ARYAN INDIA

India as the Aryans found it was not entirely savage. A restricted area in the north-west had given rise to a complex culture, probably through intercourse with Babylonia; and these Indo-Sumerians, as we may call them without alleging any community of race, had a high regard for the material comforts of life. All the streets in Mohenjo-Daro, and even the houses, were drained with fine brick runnels, while the latter, as seen here, had their private wells and paved bath-rooms.

Courtesy of Sir John Marshall, Director General of Archaeology in India

nes earlier still, such as the Nishada folk whom Purana documents describe as being black, low-statured, with high cheek-bones, red eyes and copper-colored hair.

Even in the later Rig-Veda, the first exclusiveness of Aryan society was being mitigated by treaties and alliances with Dasyu states. Intermarriage began, and there was danger that the conquerors, always comparatively few, might be assimilated in their indigenous subjects. The only practicable remedy was to recognize the conquered as an additional and inferior class within the Aryan communities, which already distinguished, in dignity and social status, between Brahmins (priests), Kshatriyas (fighting-men who were also the governing body) and Vaisyas (cultivators and artisans). Below these, accordingly, stood the Sudras or slaves, and below these again, eventually, the outcast Nishadas of hill and forest.

In the midland region the priestly Brahmins, by way of further precaution, drew more strictly the distinction between themselves and even their Kshatriya rulers. Elsewhere, and especially in the remoter regions of colonization and conquest, intermediate ranks tended gradually to disappear, leaving the single barrier between Brahmins and Sudras; while everywhere local (and especially economic) distinctions subdivided all inferior ranks into innumerable 'castes,' each with its special functions in the community, its disabilities strictly enforced by those above it and its privileges as jealously guarded against those below.

The Nascent Communities of Babylonia

THE south-western margin of the great Persian plateau is a broad belt of parallel mountain chains, which rise as abruptly above the lowland in front of them as does the Himalayan range above the plains of the Punjab and the Ganges valley. Behind—that is to say, north of—these great ranges lie the two plateau regions of Persia and Asia Minor, separated by the wildly confused highlands around Mount Ararat, but both of them connected by fairly practicable avenues with the extreme ends of the great northern grassland, the Persian plateau and Asia Minor.

Between these extreme points almost continuous obstacles preclude access from the grassland except by narrow and difficult postern gates through or past the Caucasus; and even these have the inner guard of the Armenian highlands in rear of them. All attempts on the part of the men of the northern grassland to gain access to regions south of this great mountain zone were beset with grave difficulties, and in particular were throttled down, so to speak, in passing through these two plateaux within the mountain zone itself.

On the other hand, in front (to the south) of the mountain zone lay another great flat-land, desert at its heart but grassy or cultivable nearer the foothills: the Arabian peninsula.

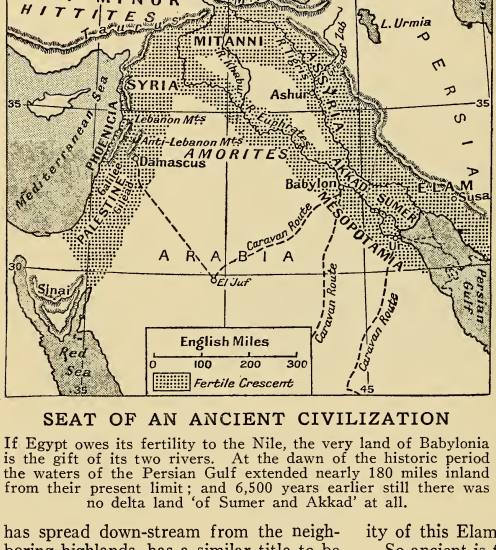
The original drainage of Arabia was eastward into the trough following the base of the Persian mountain-range which the Tigris still occupies; the Euphrates still follows such a course, and there are other great channels, now waterless, across the surface of central Arabia. The reason why Euphrates and Tigris have persisted when these other streams ran dry is that their head streams have captured the copious snow drainage of the Armenian highland; and the Tigris has an ampler flow than the Euphrates, because in addition it receives (like the Indus and Ganges) several large streams out of the snow-capped and rain-swept highlands hard above its eastern bank.

Other such streams from the east still empty themselves directly into the Persian Gulf, forming broad deltas; and the reason why the Tigris has as long a lower valley as it has, is that similar lateral deltas, uniting successively with its own, have filled up some five hundred miles of the original gulf and are advancing the present shore-line at the rate of about a mile in a generation. When this silting process began the Euphrates had its own mouth and delta on the west side of the gulf; but long ago this delta joined that of the Tigris, and the two main streams, first converging till they are within 35 miles, then dividing into several channels and interchanging their surplus waters, have

created Babylonia, a vast alluvial region over 100 miles wide, desert or grassland at its upper end, more and more swampy below, but in great part irrigable without much difficulty, and amazingly fertile. Intelligently cultivated, it bears, for example, three crops of wheat in a year.

In particular, along the water-courses the date palm grows untended; and its fruit offers a complete diet for Man and beast, a very 'tree of life in the midst of the garden.' Whether the vine, which has spread down-stream from the neighboring highlands, has a similar title to be called a 'tree of knowledge' is a question less easily answered; but a region so simply and adequately endowed with the necessaries of existence, and supplied with numerous and inexhaustible streams, was a paradise which could hardly escape the notice of its neighbors, from the moment, not so very long ago in the vista of the past, when it began to come into existence. If we could be sure that the rate of alluviation had always been what it is now, we might reckon the starting point as about 12,000 years ago; while if that rate has been increasing, as seems likely, the period must be correspondingly greater.

What kinds of men were in a position to take advantage of these exceptional natural resources we may infer from the surroundings of the region. On the east the foothills of the great range are within sight, and the swift streams which intersect them descend from luxuriant forest country within which the long troughs between its ridges are sufficiently choked with torrent debris to form those happy valleys of pasture and parkland to which the Persian word 'paradise' applied.



SEAT OF AN ANCIENT CIVILIZATION

If Egypt owes its fertility to the Nile, the very land of Babylonia is the gift of its two rivers. At the dawn of the historic period the waters of the Persian Gulf extended nearly 180 miles inland from their present limit; and 6,500 years earlier still there was no delta land 'of Sumer and Akkad' at all.

The home of the Persians indeed was a group of such upland plains; and though the Persians themselves were Aryan-speaking immigrants (of no very ancient memory), into this nook of the region for which an older name was Elam, the great mound on which 'Shushan the Palace' was eventually built for their kings testifies by its immense depth of ruins—period on period and settlement on settlement—to the great antiquity of an orderly civilization there. Other sites in similar situations to that of Susa are revealing the extent and quality of this Elamite culture.

So ancient is the Elamite regime that it outlasted two whole cycles of climatic change, and it was apparently only during (or just after) the second cycle of prosperity that Elamite prospectors began to settle permanently in the already extensive delta-lands, and made their characteristic pottery there, in considerable townships built of sun-dried brick and occupied by folk with cattle-ranches and corn-fields as well as the native palm-groves. Similar settlements were coming into being up the Tigris also.

But all this is only one aspect of the matter. Like the mountain zone, the great flat-land of Arabia had its indigenous breed of men. It had been occupied by hunting folk since a fairly early period of the Old Stone Age, but by the time that the first settlements with painted pottery were established on the alluvial region, this earlier breed had been superseded by a variety of that very uniform, slightly built, long headed, brunette, wavy haired and sparsely bearded race which still dominates the whole of the southern flat-land from Morocco to the Red Sea and from the Red Sea to Mesopotamia, and is represented in this eastern region of it by the Arab type of man.

The culture of these primitive Arabians can only be inferred from the strict limits imposed on all human societies which inhabit treeless but grass-grown regions. Like their successors at all periods, they were pastoral and nomadic, with the facility for rapid, organized attack, ruthless exploitation of sedentary neighbors and demoralization and collapse after short exposure to the luxury of conquest that characterize all such societies. We know that when their range of movement became wide enough, and in particular when the date palm had been introduced from the river margins into the spring-watered oases within their desert habitat, they were able to supplement their pastoral resources and the loot from their raids by profits from the transport of commodities between the settlements on the opposite edges of the desert, and in particular by their own knowledge and exploitation of desert herbs, many of which are fragrant or medicinal and consequently in great request wherever their properties are known.

At the terminals of cross-desert routes, and consequently on the very margin westward of the delta land, grew up settlements such as Ur 'of the Chaldees' in quite pre-Chaldaean times; where foodstuffs, textiles and other manufactured surplus of the delta towns were warehoused against the coming of the camel-folk, and exchanged for the cargoes of the 'ship of the desert.' And seeing that the eastern mountain zone had its valued products, too, the Babylonian cities became centers of a very complicated system of trade, and they amassed the wealth of the middleman.

As the delta land was newly reclaimed, the problems of a conquered country with a servile population hardly arose; for though slaves were acquired from abroad, or by capture in war, they were never a danger to society and could work their way to emancipation. And while there was thus no past to outlive, there seemed to be no future for which to prepare. With a singularly high sense of equity between man and man, there was little need to call in another life to redress the evils of this.

EVIDENCE OF EARLY AGRICULTURE

A painted jar of early Sumerian workmanship, dated to about 3500 B.C., was found to contain grains of wheat which some experts assign to a fine and highly developed species, Triticum compactum. If so, Sumeria was ahead of Egypt, with its contemporary spelt wheats.

Courtesy of Professor Langdon

The only disturbances of these orderly, efficient and prosperous communities

arose from occasional floods, from oppressive or incompetent priest-kings, from raids out of the desert or the hill country, and (as the delta land became fully exploited) from quarrels between neighbouring cities about boundaries or water-rights. These quarrels sometimes led to temporary subjection of one city to another, and occasionally a single strong 'patesi' (priest-king) ruled all or most of the region 'in the power of his god.' But usually the god's power varied as his servants changed.

Farther north, in the region known as Akkad as distinct from Sumer in the south, the contrast between continental desert and recent alluvium was less marked, the access from desert to cultivable land was more open, and inroads of Arabian nomads more frequent. But, for the same reason, acclimatization was easier and here the pastoral intruders had come to stay. It is the same story as has been traced already in India and in northern China.

The Growth of Egypt's Early Culture

THE Nile valley is as ancient a feature in African geography as the delta land was recent in Babylonian. Even the Nile Delta was already a large region of great political importance before the beginning of the Egyptian kingdom.

Both the desert plateau and the earlier deposits of gravel along the valley sides yield flint implements of successive periods and styles within the Old Stone Age, corresponding with those of other parts of Africa, of western Europe and of the Arabian desert and the caves of Palestine. These periods of the Old Stone Age were over, however, before the present deposits of Nile mud began. But since the mud has now covered the valley and has for some while been slowly encroaching on the lowest terraces, there is reason to suppose that the earliest relics of the New Stone Age are buried in it out of reach.

Beyond the limits of the mud-flat, however, remains of human occupation are numerous. The earliest of them range so far back before the use of metals was habitual, and are of so antique a fashion, that it has been suggested that they supply a link with the crafstmanship of the obscure Solutrean phase of the Old Stone Age. But though this is in dispute, it is at all events certain that the characteristic arts and crafts of the predynastic period had a distinct and quite barbarous predecessor, which Sir Flinders Petrie calls the Badarian culture after the district which exhibits it best.

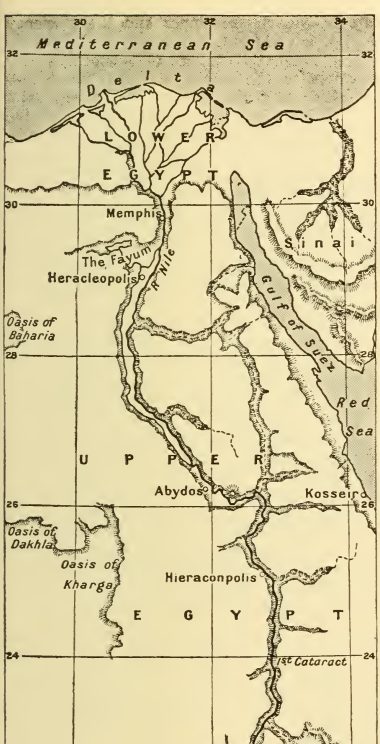
Between the Badarian and the predynastic cultures some crises occurred —not necessarily rapid—which differentiated the customs and industries of the valley-folk from those of Nubia and all other African regions and gave Egypt a civilization of its own, remarkably uniform from end to end of the valley and already mature in the earliest sites which are accessible to excavation.

Of the settlements themselves we know little, for they were probably on the mud-flats, like the modern villages; but the tombs, to economize soil, were on the desert edge, and it is from their contents that our picture of predynastic life is reconstructed.

For, unlike the Sumerian, the Egyptian of these early days looked forward to an existence after death, and took painfully elaborate precautions for the well-being of the departed by providing the corpse with all necessary and many desirable things. Later, great ingenuity was expended in conserving the body itself, and in supplying portrait models of the deceased, in case the real body should be defaced before the 'latter day.'

Though there is no evidence of administration on a large scale, or of elaborate worship of gods, the valley seems to have been already divided into tribal territories whose standards—on their river-craft for example—bear some of the provincial badges of historic times; and figures of animals found in some of the graves represent creatures which were worshipped later. Occasional objects of foreign material, such as turquoise, point to distant intercourse.

The inhabitants themselves were of uniform build, and belong to the same brown-complexioned race as the people of Arabia, of all North Africa and of most parts of Mediterranean Europe. Only at one rather late phase is there a hint of the arrival of any fresh strain as yet, and this was gradually absorbed among its neighbors.



THE TWOFOLD LAND OF EGYPT

To get an idea of Egypt as it must have seemed to its 'dynastic' invaders, who appear to have come via the Delta, this map should be held upside down. The map of India in page 184 might be treated in like fashion, for its invaders, too, came from the north.

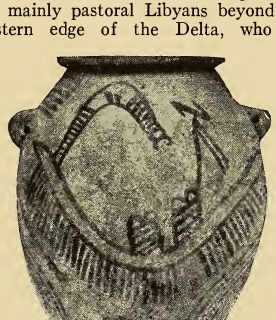
The cereal crops, however, raise a difficult problem. Barley and spelt-wheat, which these people cultivated, do not grow wild in Egypt; they do, however, grow wild in a few places in North Syria and elsewhere round the margins of the Arabian desert, and it has been inferred that the knowledge of them came to Egypt from this region. Similar doubt rests at present on the origin of copper, and of the art of working in hard stones.

This predynastic civilization, however, is separated from that of the historic Egyptians by a period of crisis, the material evidence of which is impressive, and its historic aspect is now becoming fairly clear. The study of the remains of many thousand individuals from early graves shows a sudden and progressive introduction of a foreign people, of Asiatic breed, akin to that broad-built type which has occupied the mountain zone from the earliest times and had spread into Palestine during the later Stone Age. In Egypt these newcomers become more numerous and more widespread up the valley until the Fourth Dynasty, and thereafter became absorbed in the mass of the population, appreciably modifying its average type.

As their first appearance was a little before the establishment of the First Dynasty, and in the lower part of the valley, it is reasonable to connect their appearance there with the political revolution which followed. The worship of Osiris, however, which eventually became a central fact of official Egyptian religion, presents features which suggested that it originated in a land of pastures, of coniferous trees and of other vegetation quite alien to Egyptian conditions; and the use of the same hieroglyphic sign for right-hand and for west suggests that the first users of it 'had their faces toward the south' when they occupied the valley.

In Egypt, as in India, the invaders, once arrived, were able to work out their own destiny almost undisturbed for a very long time. Much as, in India, there was an occasional set-back through the rise of powerful chiefs in the unconquered south or among the unprivileged masses, so too in Egypt there was occasional reaction against the dominant culture and its administrators, and

occasional conquest more or less complete by warrior folk from Nubia or the Sudan, imperfectly civilized from Egypt itself and acquainted thereby with its immense resources and also with the weakness of its actual rulers. And much as, in India, Aryan expansion was checked and modified eastwards by independent intruders of Mongolian origin at the other end of the Himalayan chain, so in Egypt the inheritors of Asiatic traditions were in recurrent danger from the mainly pastoral Libyans beyond the western edge of the Delta, who repeatedly established themselves on this side of Lower Egypt and occasionally threatened the valley. Internally, also, the social structure of Egypt went repeatedly through the same kind of phases as that of Aryan India, and also of northern China. The initial vigor and freedom, in art, in religious inspiration and in centralized administration, which culminated in the achievements of the Fourth Dynasty (the Pyramid Kings), of the Twelfth, of the Eighteenth and of the Twenty-sixth, gave place to a more and more rigid conventionalism which paralyzed alike the freedom of the craftsman, the self-mastery of the individual worshipper and the efficiency of government.



EARLY EGYPTIAN LIFE REVEALED BY POTTERY

The fondness of the predynastic Egyptian for subject decoration on his vases gives many clues to his culture. The boats with tribal badge on a standard prove an early proficiency in the navigation of the Nile.

From the British Museum

What the notion of personal purity was to the Aryan in India, preoccupation with the future fate of soul and of body was to the Egyptian. And the result was that the Egyptian priesthoods, both in great temple corporations and as chantry priests maintained by pious endowments on every large estate, became a social restraint and on occasion a cause of political disturbance, through the monopoly they claimed of the sources of life after death, as dangerous as the Brahmin monopoly of the means to attain purity.

And just as in China the provincial magnates, in Babylonia the patesis of the great cities and in India the territorial dynasties were the recurring obstacle to any kind of larger nationalism or to the greater achievements which such cooperation might have secured, so in Egypt the territorial nobility were the perennial critics of the Pharaoh and frequently rebelled against him. At the same time they were so jealous rivals of the temple-priesthoods that it was the traditional policy of the Crown to play off one set of interests against the other, much as medieval kings played off the Church against the barons.

Sources of Civilization in the Aegean Islands

THERE remains to discuss one other cradle of early civilization the Mediterranean, or, more accurately, the Aegean.

Our survey of the great civilizations of the Nearer and the Farther East shows them to have, beneath all the variety and originality of their achievements, certain broad similarities of origin and circumstance. In particular, they all arose within great continental land masses, and were sustained, so far as material maintenance went, by the copious and perennial water supply of great rivers.

Now the seas into which the great rivers of the Old World empty themselves differ greatly in quality. The China Sea and the Indian Ocean are open expanses, and the Babylonian rivers fall into the choked and shallow end of the Persian Gulf. No wonder that the sea

counted for little in these continental regimes.

Egypt fared differently, for the sea beyond the Delta frontage was neither open tide-swept ocean, nor a land-locked, mud-choked cul-de-sac like the Persian Gulf, but the largest of a great group of lake basins which have had somewhat the same effects on the land regions around them as the lake region of North America, but on a far larger and profounder scale.

Of the principal basins, the West Mediterranean lies wholly within the embrace of the mountain ranges; the Black Sea and the Caspian partly within, partly to north of them; the East Mediterranean wholly outside to the south. But the two annexes of this East Mediterranean, the Adriatic and the Aegean, penetrate deeply among the mountain ranges. In the Aegean a whole section of the mountain zone itself has collapsed.

The coast lines are very irregular, with drowned valleys between rugged promontories prolonged into deep water by chains of islands and reefs. But across the middle of the sunken area, and dividing its Thracian from its Cretan basin, the peaks of a considerable mountain chain form the Cyclades islands, the largest of which, Naxos, is well nicknamed among its neighbors 'The Little Crete.'

In this midland region within the Mediterranean Sea, the peculiar configuration, climate and general conditions of life which characterize the Mediterranean lands as a whole are exhibited with typical precision.

The Mediterranean is so nearly cut off from the Atlantic and so limited in its own extent, that it has hardly any tide. This greatly facilitated seafaring at all periods, and the rarity of navigable rivers made the lack of tidal estuaries less inconvenient than it might otherwise have been. On the other hand, there are perceptible currents; in particular a general counter-clock-wise circulation, which carries boats issuing from the Nile mouths along the Syrian coast, and then past Cyprus to the south coast of Asia Minor and Crete. Coastwise navigation is aided further by the daily alternation of land and sea breezes, especially where the coast stands high, and the land cools sharply at night. Consequently, early navigators

WHERE THE AEGEAN CULTURE THROVE

In the sea-drowned section of the mountain zone known as the Aegean, it is obvious that the intercourse necessary for cultural advancement must have come by ship; and, as we should expect, influence from several directions can be traced in the early civilization of this diverse island world.

from the Delta had every facility for approaching the Syrian coast first, and the great bend of the coast between Syria and Cilicia was also discovered early. Thus far, there is no special reason to suppose that Egyptians reached the Aegean either early or often, though clearly the outward voyage was not beyond the capacity of seamen who frequented Byblus.

What is significant is the facility for return. All through the summer months a steady wind from the north blows from the Black Sea region into the overheated Sahara. From Rhodes and the east end of Crete, therefore, it is plain sailing to the mouths of the Nile, and if the voyager makes the Libyan coast anywhere west of the Delta, the current and the shore breezes soon put him at home.

It is a further question, if and when Egyptian seamen reached Aegean lands on a round trip of this kind, what sort of people and mode of life they encountered there. Here the actual remains of Aegean peoples, from early tombs in Crete and the Cycladic islands, give an important clue.

All through the mountain zone its own peculiar type—or group of types, for there are varieties more or less highly specialized,—constitutes the great mass of the population throughout historic times, and has been steadily increasing its range, overflowing for example into peninsular Italy, and widely into east-central and west-central Europe north of the mountain zone. It would be natural therefore to expect that it would dominate the shores of the Aegean from the first.

But, in fact, this is not so. Eurafrican man (or 'Mediterranean,' as he is commonly called) is found established in Crete and in some of the Cyclades at the very beginning of the Bronze Age, and throughout ancient times the Greek-speaking population of the Aegean coast lands remained far more Mediterranean in type than the geographical position would have suggested. Moreover this occupation was already old when we can first trace it, for side by side with fairly pure Mediterraneans and Alpines there are mongrel individuals whose remains combine certain characters of both.

To account, therefore, for the presence of Mediterranean men in the Aegean we must presume a knowledge of navigation both early and proficient. This inference is supported by features of early Aegean culture, most easily recognizable in Crete, but perceptible also in the Cyclades.

Below the oldest foundations of the Bronze Age palace at Knossos lie the remains of neolithic settlements accumulated to a depth of more than twenty feet, and illustrating a long period of slow advance in culture. The stone implements resemble those of Asia Minor and peninsular Greece; but the pottery belongs to a type which is widely spread round the Mediterranean shores from the Syrian coast to Sicily, Malta and Sardinia, and moreover betrays the same dependence on basket work for its ornament, which is characteristic of traditional schools of ornament throughout North Africa. Occasional objects of shell (from the Indian Ocean) are clearer proof of intercourse with people who had access to those waters.

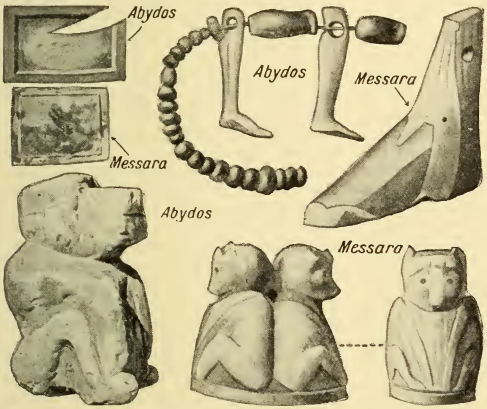
In due course the use of copper and bronze reached these Aegean settlements, and therewith events began to move rapidly. Neither Crete nor the Cyclades possess any such resources of metallic ores as Cyprus, or North Syria, and the first Aegean types of bronze implements are borrowed; in the Cyclades from Asia Minor, and from a repertoire which has a wide distribution into east-central Europe also. In Crete, on the other hand, the principal foreign influences are from North Africa. But the considerable influence exercised for a while by the Cyclades on the culture of Crete suggests that there was here some source of inspiration other than that enjoyed by the larger island.

Naturally, as the occupants of Crete achieved their eventual mastery over the manifold resources of this great island, their prosperity and the range of their influence grew, and gave them prolonged predominance over their Cycladic neighbors. But in the earliest period each group of settlements developed in the main separately, and it was the Cyclades which lay in the more favorable position for exploring adjacent districts of the Greek mainland, communicating their

own experience and skill to them and probably also learning from the 'painted ware' culture which was already ancient there, derived it seems, from the open country east of the Carpathians.

It is in the Cyclades also that we trace more clearly the interaction of elements derived from the Asiatic mainland, with survivals of the stone age culture of the south. Account must also be taken of the natural resources of the islands themselves, and especially of their obsidian, marble and other desirable minerals.

Thus came into being the culture, to the Cretan variety of which Sir Arthur Evans has applied the name 'Minoan,' borrowed from the legendary sea king Minos, the first 'ruler of the waves' in the Aegean.



CRETAN TRINKETS WITH EGYPTIAN PARALLELS

The most striking examples of Egyptian influence on Crete appear in luxury objects, amulets and the like, of which we may surmise that Egyptian imports largely consisted. Compare these leg-amulets and monkeys found in the Messará tombs (Crete) with their prototypes from Abydos (Upper Egypt).

From Xanthoudides, 'Messará,' and Petrie, 'Royal Tombs'

Conclusion: Features of Early Civilizations

NOTHING has been said here about the two principal civilizations of the New World—in Central America, especially in Mexico, and in the Andean highlands of the Inca Empire. But in spite of the profound contrast resulting from Man's failure to domesticate the American bison, and from the total absence of the horse and other beasts of burden except the llama, the successive descents of Toltec and Aztec conquerors out of the south-eastern regions of North America—dry, featureless and exposed to periodic fluctuations of climate—into the moister and more fertile oases of Mexico and the cultivable clearings of the Isthmus forest region offer obvious analogies to the processes of civilization in the Old World. So too does the spread of the Inca empire from a highland plateau towards forest and lowland. But it is too early for more than the most tentative application of our general conclusions to the perplexing phenomena of the New World.

It remains now, after even so brief a survey of the conditions in which these various cultures arose, to make a few elementary comparisons between them, and suggest a general description of the processes by which they all alike came into being.

On their economic side all the four river-valley civilizations have in common one fundamental character. They depended, in their maturer phases at all events, and in three out of the four from their first beginnings, on the control assumed by the men who created them over a single physical factor in their natural surroundings. This was the perennial water supply of great rivers which all—though for different reasons—reach their maximum annual flow at the season when the growth of vegetation is most vigorous, provided that water is available, but least possible if water is withheld.

Now it is the essential distinction between barbarism and civilization that in the former state men live as they must, while in the latter they live as they know how. Culture, indeed, might be described in general as Man's state when liberated from natural controls; not in the sense of complete freedom from such controls, but in the sense of wider, more manifold and more intimate interaction between Man and nature.

There have been three main stages in Man's dominion over the land on which he lives and by whose produce he maintains and comforts himself. In the first, he leaves the soil as he finds it and is restricted therefore to nature's own yield of self-sown, uncultivated fruits. In the second he transforms the soil by digging and ploughing, and either selects among the natural growth the kinds he prefers for his own purposes, treating the rest as 'weeds' or else wholly substitutes special crops of his own breeding.

Only in the third stage does he explore beneath the surface, and make mineral resources his reservoir not of maintenance but of power; arming himself for defence and for aggression, against natural dangers and obstacles no less than against his fellow men, and supplementing his own small strength by longer arms, swifter feet, defter fingers and subtler signals for co-operation with his fellows than his physical frame provides.

There have also been three main stages in Man's assumption of control over water. In the first, water is utilized for production; in the second, for transport; in the third, not fully realized yet, for power. The riverside cultures result from the first of these, by the redistribution of naturally flowing water through artificial channels so as to moisten land which it does not naturally reach.

Perennial water-supply, in irrigable land, on a sufficiently large scale to maintain a considerable surplus of population besides the actual cultivators, enabled the latter to enjoy conveniences and even luxuries provided by the craftsmanship of those others, and also the immaterial amenities which leisure alone can supply: poetry, music and the fruits of meditation. And communities as composite as these acquired other elements of civilization, at the risk of perishing for lack of them.

Chief among such are, first, organized production of surplus commodities required for exchange with the surplus produces of other regions, foodstuffs and manufactured articles paying for articles of luxury or occasional use, such as drugs and gems; or invisible imports, such as security for travellers, purchased by blackmail to bandits. Secondly, there is organized defence against external enemies, and also against that predatory adventurer within the gates, the ubiquitous profiteer; hence the systematic administration of justice and the consolidation of normal behavior into codes of law, with penalties for breach of wholesome usages. Thirdly, in all cases, and usually quite at the outset, there is an organized device for communicating information and instructions, by means of a system of writing; used also eventually to perpetuate and accumulate experience, useful knowledge of various kinds and works of verbal art which otherwise hover precariously between lip and ear, or perish at their creation. Cumulative record of events led easily to the appreciation of sequences in time; to the invention of an accepted calendar, and to great advances in astronomical observation. Fourthly, organized agriculture and commerce required accurate apportionment—of land, materials and commodities, by measures of length, area and capacity; of labor by measures of time; of produce, by weights; and of the relative value of all these by scales of wage and profit.

These great discoveries, once made, were necessarily sanctioned and maintained by political administration. Now in all the great river cultures government was fundamentally theocratic; that is to say, the actual human governor, whatever the history of his acquisition of public authority, claimed for his words and deeds the sanction of a divine superior, usually recognizable as one of the greater forces or facts of nature.

Of such theocratic systems the most familiar to ourselves is that which is proclaimed in the Ten Commandments of the Mosaic Law. On the one hand,

there is the duty of the individual towards his God; on the other, his duty towards his neighbor, which is almost wholly negative, the sole 'commandment with promise' being that which sanctions the foundations of society itself.

The negative character of political and social duties results in part from the primitive equipment of fears and restraints which is characteristic of simple societies, and is only dissipated when experience and reason combine to prove that things traditionally taboo, or as we say 'not done,' *may* be done without disaster, provided they are done with knowledge of the circumstances and self-restraint founded on this knowledge.

This rational claim to individual freedom of choice, however, comes late, if ever, in the development of theocratic cultures, and always as a protest against a jungle of prohibitions through which no way seems left. For the men of the theocratic cultures, their God is a 'jealous God,' exercising and guarding a monopoly of wisdom, and therefore of power, like that claimed so disastrously by his earthly representatives. As with a capricious ruler, many of 'his ways are past finding out': while his justice may be tempered with mercy, you may tamper with it by gifts provided that you know how.

Under such a government human initiative and human reason took subordinate place; they were resources to be employed discreetly, lest they thwart unawares the divine government of the realm of nature and of human destiny. It is only in Greek thought that law is at the same time the 'gift of the gods' and the 'opinion of sensible men,' justifiable before the judgement seat of common sense. It was indeed this 'opinion of sensible men' that the Greek felt to be missing in the kingdoms of the East as he knew them, just as Confucius found it wanting in China, the Buddha in Nepal, and Hammurabi in Sumer and Akkad.

Behind these real, though superficial, resemblances, however, there stands in each of the great ancient civilizations the same fundamental cause both of their stability and of their failure to proceed beyond a quite definite degree of organized welfare: namely, the fact that they each rested on exceptionally complete acclimatisation throughout a group of people, originally homogeneous and acclimatized to a more ancient home, but transposed into quite different circumstances in a new region where it was necessary, if they were to maintain themselves at all, that they should accept their fortunes as they found them.

This effort of adjustment involved more or less complete, and sometimes deliberate, discarding of traditional ways of living, the invention of fresh devices, the acquisition of new habits and beliefs. But it resulted also in unforeseen survival and adaptation of ancient behavior, and the perpetuation of tribal or national convictions among novel surroundings, until some kind of working compromise was attained, sometimes very special and strictly defined, like the daily round of the rice grower, where deviation leads straight to disaster. In this aspect, as the sum total and result of efforts and aspirations in innumerable living personalities, the rise of a great civilization ceases to be 'ancient history' and takes place in that experience of life which is open to us all.

EARLY EGYPTIAN LIFE AND CULTURE

THE CIVILIZATION OF THE NILE IN PREDYNASTIC TIMES AND ITS FLOWERING UNDER THE OLD KINGDOM

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THERE is no country where we can watch more easily the effect of surroundings on character and conduct than Egypt.

The physical characteristics of the country are easily described. It is divisible into two quite distinct parts, Upper and Lower Egypt. Upper Egypt conforms to the geometrical definition of a line: it is length without breadth. It runs from the apex of the Nile Delta, roughly the modern Cairo, to the First Cataract at Aswan, a distance of 547 miles. At no point does its breadth exceed twelve miles, and in places it is only a few hundred yards. It should be remembered, too, that this line which is Egypt is not on the level of the surrounding country, but is sunk in it to a depth of about three hundred feet.

Thus the ancient inhabitant of Upper Egypt lived in a narrow valley, his horizon limited on either side by the limestone cliffs at the top of which lay the desert, a land which played little or no part in his life. Land for him was of two kinds —the Black Land, which was his name for Egypt on account of the dark color of its soil, and the Red Land, which was his name for the sandy desert. He had no frontiers, and little or no conception of foreign countries, though the hieroglyph with which the word for foreign land is written shows that it was conceived as mountainous in contrast with the level plain of Egypt. Similarly, he could not imagine a country which had no Nile: north was for him the direction in which the river flowed, though in reality its direction is in places more nearly east or west. In consequence, he regarded Mesopotamia as a country turned upside-down, for there the river flowed south: nothing could indicate more clearly than this standpoint the insularity of the ancient Upper Egyptian.

In the Delta, or Lower Egypt, conditions were very different. In this flat triangle of land, comparatively recent in formation, there was scarcely any limit to the outlook, and to its inhabitants it must have appeared as a vast level plain extending to the horizon in all directions, unbroken by hills or even undulations. Here, though the conditions of labor on the soil were much the same as in Upper Egypt, the broader outlook and the absence of the desert cliffs, giving a sense of freedom in every direction, cannot fail to have produced a different effect upon the mind of the inhabitants.

Both parts of Egypt enjoy a good climate. In winter the days are warm—though cold winds spring up occasionally —and the nights cool. In the Delta rain is not infrequent at this time of year, but Upper Egypt rarely sees rain, and a really heavy downpour occurs only once in about ten years. In summer—say, April to October—the whole country is exceedingly hot, though this heat is naturally much more trying at an up-river town like Aswan than it is at Alexandria or even Cairo.

Such are the main physical characteristics of the country. Equally important from the point of view of social development is its geographical position. It guards the entrance to Africa against aggression from Nearer Asia. This latter area seems always to have been a center of disturbance, and at times of maximum

unrest there was a strong tendency for its populations to overflow into the fertile Delta of Egypt. Such invasions of the Delta from the east occurred several times in Egyptian history, on each occasion with results disastrous for the time being.

The Delta was hardly more secure on the west than on the east, for there lived, without even an intervening strip of desert, the various tribes of the Libyan people who inhabited not only the coastal region but the oases that stretch southward far into the interior of Africa. Some of these Libyan tribes may actually have held the western Delta in predynastic times, and throughout Egyptian history they were ready at the slightest hint of weakness or internal dissension in Egypt to slip back into the fertile lands which they may well have regarded as their ancient inheritance.

From these storms which so often broke over the Delta Upper Egypt was, fortunately, almost immune. She had no neighbors to east or west, and the impassable desert precluded attack from either side. To north or south her country could be defended by a battle front of no more than a mile or two, nay, of a few hundred yards if the spot were well chosen. To the north, the Delta might be regarded as forming a buffer against both Asiatics on the east and Libyans on the west. To the south lay the wild tribes of Upper Nubia and the Sudan, who, so far as we at present know, never gave Egypt serious trouble until the time of the conqueror Piankhi in the eighth century B.C.

Conditions in Upper Egypt, therefore, had a stability which was lacking in the Delta. On each occasion on which the Delta fell into foreign hands we find an Upper Egypt unconquered, still carrying on, although sometimes under miserable conditions, the political and social traditions of the past, and ready, when the confidently expected "savior" should at last arise, to expel the intruders, to resume her past self and, externally at least, to rise to fresh heights of accomplishment.

Our earliest picture of Egypt takes us back well beyond the beginnings of the First Dynasty, and shows us the whole of Upper Egypt and Nubia in the hands of a single race with a homogeneous civilization, the so-called predynastic people. Year by year the veil is lifted a little higher, and now we can trace the fortunes of this predynastic race back to perhaps 15000 B.C. Even when we first meet them they are no longer savages. They are already probably acquainted with copper; they have their arts and crafts, and, above all, they are agriculturists.

Of the three essential occupations of early Man, hunting, pasture and agriculture, the first can never have played a very great part in Egyptian life. It

THE KEEN-EYED SCRIBE

Reproduced from a colored statuette found by Mariette in a tomb of the Serapium, this fine figure of a scribe dates back to the fifth or sixth dynasty (c. 2700-2550 B.C. and 2550-2350 B.C.) and the face and form are full of character. The sculptor gives us a complete character study of his sitter, whose attention is riveted upon the subject he is about to record upon the papyrus, while he sits in the immemorial pose of the East.

Louvre, Paris

is highly probable, indeed, that in ancient times the desert that flanked the fertile valley on either side sheltered more numerous and more various wild animals than it does today. A predynastic slate palette shows us an organized expedition

against lions, and throughout Egyptian history scenes in the tombs of the great nobles represent their owners as taking part in hunting expeditions, in which not only lions but panthers, oryxes and antelopes are pursued and shot with arrows.

Yet hunting has become a sport for the great, not a means of livelihood for the people, whose needs in the matter of flesh food, never very great, were easily supplied from domesticated animals and birds.

If the hunting of wild animals had, in the main, become a sport for the leisured, it was not so with the trapping of birds and the netting of fish. The marshes of the Delta must then, as now, have been the haunt of innumerable wild-fowl, which were caught in traps and afterwards fattened for the rich man's table. There are endless representations of this in the tomb-paintings, and portions of traps have actually survived.

Fish, too, were eagerly pursued, and, unlike flesh and poultry, formed part of the ordinary diet of the common people. The professional fisherman caught them on a hook or with a seine-net, but the great lord amused himself trying to transfix them with a spear.

Thus the early people of Egypt were not in the true sense of the term hunters, and they were not constrained by that necessity of following a moving prey which tends to make a hunting people mobile and unsettled. The lion, the elephant and the hippopotamus might retreat from Upper Egypt to Nubia and thence to the Sudan, but there was no occasion to pursue them.

Anthropologists may dispute whether a people ever advances directly from the hunting stage to the agricultural without passing through the pastoral. The question need not concern us here, for in Egypt in predynastic times we find both pasturage and agriculture firmly established side by side in an interdependent system. For this very reason the Egyptians cannot be considered as a pastoral people in the true sense of the term, nor is Egypt in any sense a land naturally adapted for pasture.

EGYPT'S PROPITIOUS SITUATION

A narrow valley, for the most part, between barren deserts, Egypt was sufficiently isolated to allow of the uninterrupted growth of its civilization, while the openness of the Delta to attack from east and west prevented the stagnation of complete segregation.

In early times it is possible that agriculture had not yet absorbed the whole country, and that there were still grasslands devoted to the cattle. Yet even under the Old Kingdom the shortage of meadowland was so serious in Upper Egypt that cattle were regularly sent in charge of their herdsmen to the Delta for the summer months, and it may well be that in later Egyptian days the situation had reached the stage which we see today, where the domestic animals are not put out to graze but fed entirely on foods specially grown for them.

The Egyptians domesticated few animals for the sole purpose of providing

food. The cattle, of course, gave milk, and to the richer classes flesh, but they also formed one of the principal means of transport of the country, being more important in this respect than even the donkey. They were consistently used for ploughing. Sheep provided not only food but also wool, and were further used, as also in later times were swine, for treading in the newly sown seed. Among the other domesticated animals were the goat, the dog—generally the "slughi" hound, a breed still used in the Sudan—and the ubiquitous cat. The horse is not found until after the Hyksos invasions, and the camel remained virtually unknown until Greek times. Among these animals the ox occupied a paramount position, which will readily be appreciated by those who are acquainted with his noble modern descendant, the "gamûs" or buffalo of Egypt.

The Egyptians can hardly be said to have domesticated any birds. The marshes of the Delta abounded in edible fowl of many kinds, and it was judged more economical to capture these in nets as they were needed, and to fatten them for short periods for the table, than to be at the expense of fully domesticating them. It may be added that the domestic fowl was unknown in Egypt until the New Kingdom, when one of the marvels brought back to Egypt from the Syrian expeditions of Thothmes III was a group of "birds which bring forth (i.e. lay an egg) every day."

ANCIENT DEVICE FOR RAISING WATER

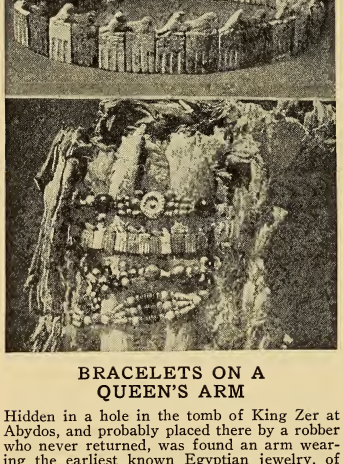
The shadûf was as necessary to the laborer of ancient Egypt as it is to the fellah of today, in enabling him to raise water for irrigation. Modern shadûfs (top) are astonishingly like those used by the two servants (in the lower picture: c. 1250 B.C.), and probably 1,500 years earlier they were little different.

If pasturage occupied a large number of people in ancient Egypt agriculture must have employed still more, at least during certain periods of the year. The Nile, though kind in one sense to the country which she had created, was unkind in another: kind in the sense that by her annual overflow she provided a fresh deposit of soil so rich as to make the use of fertilizers of any kind almost unnecessary; unkind in that, having done this, she refused throughout the rest of the year to provide any natural irrigation. Since there was no rain, the prosperity of Egypt depended on the energy of its agriculturists in raising water from the river and directing it through canals and channels into the fields.

This was done by the same simple

means that is most widely employed today, the so-called shadûf. On the river bank a long pole is hinged not far from its middle on an upright column, so as to swing like the beam of a scale. From the end nearest to the river hangs a bucket on a short length of rope, while at the other is a stone or ball of mud to form a counterpoise. The worker by means of his own weight pulls down the bucket and dips it into the river. He then allows the counterpoise to raise the full bucket, which he empties into a channel at a level of five or six feet above the river.

The chief crops of ancient times were barley (of two kinds), spelt (very similar to wheat) and flax. The methods of their cultivation were simple. When the floods had gone down the land was broken up either by wooden ploughs, drawn in the Old Kingdom by oxen, or by broad-bladed hoes or mattocks of wood. The seed was then scattered and trodden in by sheep, or later by swine. Then followed weeks of daily toil at the shadûf. Finally, when the harvest was ripe, the corn was cut not far below the ears, the straw being apparently left in the ground.



BRACELETS ON A QUEEN'S ARM

Hidden in a hole in the tomb of King Zer at Abydos, and probably placed there by a robber who never returned, was found an arm wearing the earliest known Egyptian jewelry, of gold and turquoise and lapis lazuli beads (enlargement above).

From Petrie, 'Royal Tombs of Abydos'

Donkeys bore the cut corn, tied up in short sheaves, to the threshing floor, a round area of beaten mud with a low enclosure wall. Here it was trodden by donkeys or cattle, and finally winnowed by being thrown into the air repeatedly on small wooden winnowing spades, the wind carrying off the chaff, while the grains fell to the ground. The last scene in the process as it is illustrated shows us the gathering of the corn into sacks and its deposition in round granaries, usually built of mud brick, with domed roofs; the grain is poured in through a small hole at the top, to be withdrawn as needed through a larger door low down in the side.

The needs of the Egyptian in early days were few and simple. His house was a mere tent of wattle and skins, or other perishable material. His tools and weapons were of chipped flint, and he might count himself very lucky if he possessed some small ornament of the precious metal, copper. His wife's wants were hardly more ambitious than his own. She was more addicted to decking herself out in beads of various materials such as carnelian, steatite and lapis lazuli; she wore ivory hairpins and painted her eyelids with a green pigment made by grinding down malachite on a slate palette, but in other respects she was as simple-minded as her husband. When they died both were buried in shallow round or oval pits in the sand, accompanied by some of the objects most dear and most useful to them in life, for it had not occurred to them that in the next life—and they firmly believed in the existence of one—their needs could be any different from those of the present.

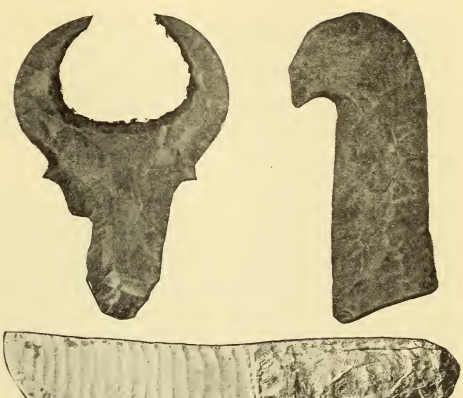
Two arts, however, the predynastic Egyptian had mastered. One was that of making pottery, the other the much more astonishing one of covering various materials with a colored glaze. The pottery was hand-made, and for artistic perfection has seldom been surpassed.

As to the length of the predynastic period it is futile to guess. We do, however, know that it witnessed very considerable material and social develop-

ment. Copper became more and more common, until it could be used for weapons and tools as well as for delicate ornaments. With copper perhaps came the use of effective drills, which enabled the harder and more attractive stones to be hollowed out into bowls of forms even more exquisite than those of the pottery. The art of flint working underwent a steady improvement, culminating in the production of beautiful, ripple-flaked knives.

With these improvements in craftsmanship went hand in hand a desire for greater material comfort and luxury. Paradoxical as it may seem, this is more evident to us in the tomb than in the house, of which, unfortunately, we know very little. The grave becomes larger; it is even undercut on one side in order to make a more roomy floor on which the now greatly increased stores of food, drink and personal objects may be deposited. It is usually rectangular in shape, and in the introduction of a lining of sun-dried mud bricks to hold back the sand lies, perhaps, the germ of architecture. In some tombs access is given by means of a stairway at one end, and we thus have already the prototypes of the two forms of tomb most frequent in the period of the Old Kingdom; the stairway tomb has only to increase in size and depth, and the old pit tomb has only to enlarge its undercutting until this becomes a regular underground chamber.

But it was in art that the most astonishing advance was made. At first the taste of the predynastic Egyptian displayed itself merely in the production of very rough female figures or figures of animals in clay, and in the application to pottery of very simple designs in color, or made by incision, mostly copied from basketwork motives. As time went on, however, there was a bolder choice of schemes of decoration. The vases with red designs on a buff ground show us plant and animal motives and even ships, and had not stone replaced pottery for the making of the finer vases this type of decoration would have been even further improved.



FLINT SUBDUED TO ARTIST'S FANCY

Not only by beautiful ripple-flaked knives, such as this with its handle of gold, is the mastery of the ancient Egyptian over flint attested, but also by the animal heads found in Abydos tombs. The specimens above are a bull and an ostrich.

British Museum and Sir Flinders Petrie

As it was, the genius of the artist turned rather to carving in ivory and slate. The simple slate palettes used for grinding eye-paint, and shaped roughly in the old days into the semblance of a fish or a bird, were replaced by magnificent ceremonial pieces in which both faces of the palette were covered with relief work showing groups of animals, battle scenes or a lion hunt, and the flint knife was now fitted into an ivory handle delicately carved with rows of animals or scenes of war and the chase.

It is lamentable that we do not know more about the structure of society in Egypt in these highly interesting times. All our evidence goes to prove that just before the First Dynasty Egypt consisted of two separate kingdoms, Upper and Lower Egypt, and that these were then forcibly united by a king to whom tradition has given the name Menes, but of

OBJECTS THAT MINISTERED TO VANITY

For grinding eye-paint for Egyptian ladies slate palettes were necessary. These were early carved into animal shapes (top), but later they developed into magnificent ceremonial objects like the lower example above (back and front) whereon is a riot of beasts mythical and actual. It comes from Hieraconpolis.

British Museum and 'Hierakonpolis' (Egypt Exploration Society)

whom, under that name, we can find no contemporary record. The fusion was complete and lasting, and except for occasional periods of stress and storm Egypt was one from this time forward.

Archaeologically, the establishment of the single monarchy seems to mark an immense advance, so immense that it has more than once been suggested that it was due to invasion by a small group of more civilized rulers from abroad. Recent discoveries, however, do not justify this conjecture. If the wealth and luxury of the tombs of the First Dynasty kings at Abydos form a great contrast to the modest contents of the predynastic tombs immediately preceding them, it must be remembered that these latter are the graves of comparatively humble persons, and that the graves of the predynastic kings have so far escaped our researches. The same fact may explain why writing seems to make a sudden appearance in the First Dynasty in a form far from primitive. If we confine ourselves to one type of tomb we see at once that the transition from the predynastic to the dynastic is perfectly smooth and gradual, and, what is more, the finer artistic products of the late predynastic period, make it clear that the art of the First Dynasty was the fruit of a gradual and an indigenous growth.

Once the monarchy was established, social and political institutions must be largely dependent on the line of development which it followed. The Egyptian king was at the outset simply a glorified local chief. The tribal chief had been ruler, high priest and law-giver to his tribe.

In the process of fusion, by conquest or consent, which transformed tribal Egypt into a monarchy, the functions of the chief must necessarily have increased so rapidly that he was forced to depute some of them at least. In theory he remained the high priest of every god. In temple scenes he still figured as the officiant in all important ceremonies. But as he could not be in two places at once it is clear that he must have been replaced by priests, and so we find even under the Old Kingdom a professional priesthood.

As early as the Fourth Dynasty the monarch selected a vizier to help him, probably in judicial as well as in administrative matters. Under the Fourth Dynasty this official was the king's son, but in later times he was chosen from some

other family. At the same time, though the king was compelled to depute and distribute his functions, he remained, none the less, an absolute monarch.

Of the history of the monarchy under the first three dynasties we know nothing, for we have no written records. Under the Fourth to Sixth Dynasties there is more material, and we can partially reconstruct the picture. At the same time, it should be remembered that our material very largely consists of titles, and that these can be misleading, the more so since they were so lavishly showered on Pharaoh's favorites that the holders of genuine offices frequently added the epithet "real" to their title by way of distinction.

The scheme of government involved a number of local administrations controlled by a central government, at the head of which stood the king. The unit of local government was generally the nome, and at the head of the nome was the nomarch, who was governor, judge and administrator of his nome, and, at the same time, high priest of the local deity. Within his area the nomarch must have enjoyed great freedom.

He was, however, responsible to the royal government for the taxes of his nome, and in the administration of justice he was in some way responsible to the central authority, which was probably vested in the vizier. The

MASTERPIECE OF EGYPTIAN SCULPTURE PRODUCED NEARLY 5,000 YEARS AGO

This fine piece of craftsmanship, the Fifth Dynasty wooden statue of Kaaper from his tomb at Sakkara so impressed the native workmen with its lifelike effect of burly authority that they christened it the Sheikh el-Beled, from a resemblance to a village headman.

The Louvre: Cairo Museum

A VERY EARLY PHARAOH

The gem of early Egyptian ivory carving is the tiny statuette known as the Ivory King, found at Abydos. He was probably a First Dynasty monarch before 3000 B.C.; his name and exploits are unknown.

British Museum

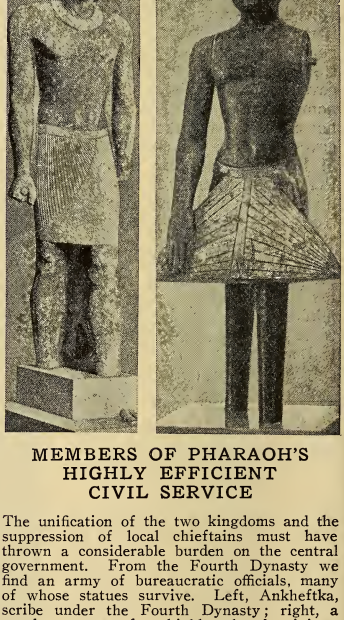
succession to the nomarchate was hereditary, though it needed the king's approval, for in theory all the land of Egypt was his.

Of the central government we know almost less than of the local. At its head stood the king, assisted by his vizier and a host of other officials. The treasury seems to have been represented by the House of Silver (a name perhaps dating from a time when silver was more valuable than gold) and the Double Granary: we read of Treasurers of the God (i.e. the king), Treasurers of the King of Lower Egypt (doubtless an old title which survived the unification of the two lands), and Superintendents of the House of Silver and of the Granaries. Of the central control of the administration of justice we know virtually nothing.

The strength and the weakness of this system of government are easy to point out. So long as a ruling Pharaoh was powerful enough to hold in check the ambition of individual nomarchs the system was sound, for government in each nome was in the hands of men conversant with local conditions. Under a weak or indifferent king, however, the immense power wielded by these local potentates at once became a danger to the state and threatened it with disruption.

We must now pause for a moment to ask how society was constituted under these political conditions. At the head of the state were the king and his court, an immense bureaucracy where titles must have been highly prized, for some individuals possessed as many as thirty or forty, the majority of which were probably quite meaningless. A similar bureaucracy, aping, doubtless, the manners of the court, must have existed in the principal town of each nome. Many of these officials must have had rich holdings of land in their nomes.

Separated from them by a wide gulf were the peasants, working as serfs on the farms of the landowners, ploughing and watering the land or tending the cattle and sheep. Of a middle class in between these we hear nothing. If such



MEMBERS OF PHARAOH'S HIGHLY EFFICIENT CIVIL SERVICE

The unification of the two kingdoms and the suppression of local chieftains must have thrown a considerable burden on the central government. From the Fourth Dynasty we find an army of bureaucratic officials, many of whose statues survive. Left, Ankheftka, scribe under the Fourth Dynasty; right, a wooden statue of a highly placed minister under the Sixth Dynasty.

British Museum

THE HOUSE-SLAVE'S TASK

There is a homely touch about this Third Dynasty statue of a woman kneeling as she rubs corn on a stone slab; it serves to show the high level reached by sculpture in the round early in the dynastic period.

British Museum

existed—and surely the traders, merchants and skilled artisans must have formed such a class—it was not rich enough to boast its own virtues in elaborately painted and sculptured tombs, and too independent to be included among the rows of servants which the nobles who built such tombs loved to figure there. Very difficult to place in the social scale are the minor priests, of whom there must have been very large numbers. They were independent and self-supporting, for they lived on the offerings made in the temples, but of their social standing we know nothing.

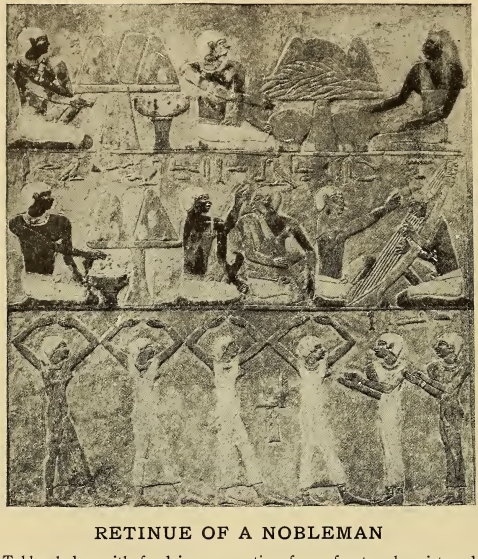
If a generalization may be permitted with regard to the conditions of life under the Old Kingdom, we should be inclined to say that the nobles and the higher officials were very fortunate and the serfs very unfortunate. These latter seem to have been little more than slaves attached to the great estates, and passed from owner to owner as part and parcel of the land. As against their owners they had probably no rights, and the punishment for even small faults was a merciless beating.

But, what was worse, they had two sets of masters. There is a long period in the Egyptian year when the inundation makes work in the fields impossible, and the peasant of today retires into his village, and, to use his own phrase, "goes to sleep." His fellows under the Old Kingdom had no such good fortune. During the months of agricultural activity Pharaoh's quarrymen had been busy cutting huge blocks of limestone in the quarries opposite Memphis. No sooner had the flood season come than the whole labor of the land was organized under government officials for the transport of this stone over the flooded fields, and its embodiment in the royal pyramid. This was a task which had no end. The king's

EGYPTIAN CARVING IN IVORY

The exceptional skill of the ancient Egyptian artists is revealed in this ivory carving, which shows the two sides of the predynastic Gebel el-Arak knife handle.

The Louvre



RETINUE OF A NOBLEMAN

Tables laden with food in preparation for a feast, a harpist and dancing girls are the subjects of this slab from Ur-ari-en-Ptah's tomb (Sixth Dynasty). It was such personal attendants that the Egyptian noble loved to have sculptured, so that we learn nothing of a middle class, though it must have existed.

British Museum

first thought on ascending the throne was for his burial-place. If it were complete before he was ready to occupy it he revised and enlarged its plan or proceeded to its lavish adornment. When he died there was the pyramid of his successor to be built.

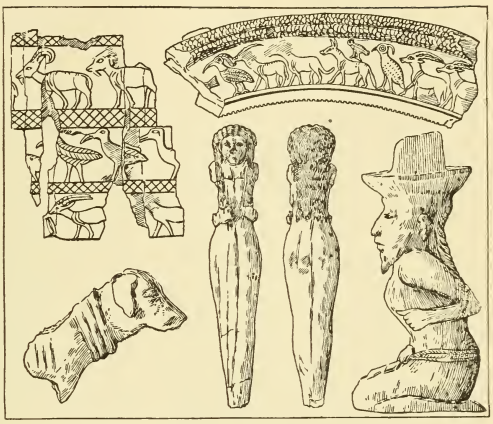
With an improvement in material conditions went an artistic development. We have seen that the seeds of this were sown in early predynastic times, and before the beginning of the dynastic age it was already a healthy plant. In decorative relief sculpture a very high level had been reached in the ivory knife handles and slate palettes, and the Narmer palette dating from the beginning of the First Dynasty, shows us many of the conventions of later Egyptian art already in being. This delicate low relief, well suited to a country of bright sunlight and sharp shadows, was destined to have a long and successful history in Egypt. We can hardly claim to be able to trace its evolution during the first three dynasties, since examples are few and far between, though the grave stele of King Za, or Zet, and many smaller pieces of work from the royal tombs of Abydos show a steady advance in the first two dynasties, more especially in technique and mastery of material. From such examples we pass abruptly to the finest sculptured tombs of the Fifth and Sixth Dynasties, such as those of Ti and Gemnikai at Sakkara. Here we have Egyptian art at its highest development.

In the drawing of this period there is much that is conventional, that is incorrect even, yet this is more than atoned for by the supreme quality of "line," that quality which draws the eyes gently on from one curve to another by easy transitions and without shock or effort. Here we are reminded of the best Chinese and Japanese work. The decorative value of Egyptian relief lies, so far as it is analysable, partly in the recognition of the effectiveness of certain details in and for themselves, still more in the admirable adaptation of the subject to the space to be filled. Given a piece of wall to be decorated, no artist will fill it for you more satisfactorily than the Egyptian.

Yet these successes were achieved in the teeth of the most cramping conventions. Perspective is almost wanting in the drawings and carvings of this era; an object which is to be represented as behind another is merely placed over the top of it. The human figure was always shown in profile, though the shoulders were represented as if seen from the front, since it was thought that this was the most characteristic view of them.

The difficulty of such a combination and the absurdities to which it must lead can easily be imagined. And yet in spite of it the reliefs on wooden panels from the tomb of Hesi of the Third Dynasty rank among the most perfect pieces of art in the world.

The standing human figure is, according to the strict convention, shown moving from left to right of the spectator, the left foot foremost. The left hand, which is advanced, holds a long walking staff and the right, which is retired, grasps in a horizontal position a sceptre, which naturally crosses in front of the body. When this position is reversed, as it sometimes is, and the figure is made to move from right to left, this sceptre is often shown passing behind the body, though, being now held in the left hand, it ought still to be in front. Here the artist's attempt to reverse the perspective has led to absurdity. Nothing could show more clearly the limitations by which the Egyptian hampered himself, and yet such limitations do not preclude an artistic result.



PREDYNASTIC IVORY CARVINGS

The already high level of artistic excellence from which the history of dynastic sculpture in the round started is revealed by these ivory carvings dating from the last days of the predynastic period. They were discovered at Hieraconpolis.
From Quibell, 'Hierakonpolis'

Sculpture in the round did not fail to keep pace with relief, and in the Fourth to Sixth Dynasties Egypt produced more great statues than in the whole of her subsequent history. Yet statuary owed its origin to a religious and not to an artistic impulse. The Egyptians believed that after death a man continued to live in his tomb in some physical sense not very different from the present life. He, therefore, needed a physical body. Hence the necessity for mummification. Experience, however, showed that mummies often went to pieces, and, as an insurance against this, portrait statues of the dead man were placed in the tomb in the hopes they might take the place of the mummy.

To this curiously crude belief we owe some of the finest portrait statues the world has produced. Some are of wood, most of stone—rarely of the hard stones like diorite and granite, though the Egyptian craftsman had no dread of these—usually of painted limestone. Let those interested in art take the statues of the Sheikh el-Beled, the Louvre Scribe, the priest Ra-Nefer, the double statue of Nefert and Prince Ra-Hotep, the Menkaura slate triads, and the metal figures of Pepi I and Meren-ra, and compare them with a similar group from any country at any period. We believe that as works of art they will at least hold their own.

The arts seldom develop quite independently, and side by side with sculpture and drawing developed architecture. When predynastic Man began to line the sides of his tomb with bricks made of Nile mud dried in the sun, architecture had begun. Perhaps he was already employing such bricks in the building of his primitive house, though planks of wood were early used for this purpose

WOOD-CARVING UNEXCELLED IN ANY AGE OF HISTORY

Wood does not seem to have been chosen as often as stone by the Egyptian carver, who delighted in setting himself the hardest tasks—though we must remember that it is more perishable. What does survive in the material from the Old Kingdom is inimitable; nothing could excel the sure characterization and spare economy of line in this panel from the Third Dynasty tomb of Hesi.

Cairo Museum

and remained popular in the early dynasties.

This art of building must have made, during the first two dynasties, immense strides, all contemporary traces of which have disappeared, for the discoveries at the pyramid of Zeser at Sakkara show a highly developed, technically perfect style of building, which its discoverers describe as marking the end rather than the beginning of an architectural era. Here, to the astonishment of all, have been found engaged columns fluted in the Doric style, anticipating by centuries the earliest examples previously known from the Eleventh Dynasty tombs of Beni Hasan.

Next in chronological order to these Sakkara remains come the pyramid temples of the Old Kingdom and the sun-temples at Abusir. And since the architecture of this period is known to us almost exclusively from funerary buildings, we must pause for a moment to consider the evolution of the tomb form. We noted above that at the end of the predynastic period the tomb tended to evolve on two separate lines, the stairway tomb and the pit tomb. Both these had a long development under the Old Kingdom.

In the first place, every Egyptian grave consisted essentially of two parts, the underground burial-place where the body lay, and the offering-place above the ground, where pious relatives placed daily gifts of the food and drink needed by the dead man in order to continue his life in the tomb. It is possible that in some

UNNATURAL ARTISTIC CONVENTIONS

Confusion beset Egyptian artist when reversing an upright figure, normally shown moving from left to right. Staff and sceptre change hands for the sake of balance; yet, from a feeling that this is wrong, the sceptre sometimes appears on the far side of the body! Here (right) it is on the near side, but for the same reason the hands are shown back to front.

Berlin Museum

The homes of the Egyptian dead show a perfect transition from the simple predynastic pit to the elaborate structures of the Fourth Dynasty. On the left is a shallow oval pit at El Mahasna, containing the corpse in its contracted position with a few funerary vases. In the same cemetery is the later burial on the right, rectangular, brick-lined and equipped with a more plentiful store of offerings.

From 'El Mahasna,' Egypt Exploration Society

Early graves, such as those at the top of this page, were probably covered with a heap of sand over a roofing of wood, and as time went on the brick lining of the tomb was carried up to contain this heap. At the same time the actual pit was undercut on one side to provide more room at the bottom for equipment. From this grave at Tarkhan (lower photograph) the sand has been removed from between the walls; note the small external court, and the slits whereby the dead might enjoy the offerings.

HOW THE HOUSING OF THE EGYPTIAN DEAD WAS ELABORATED

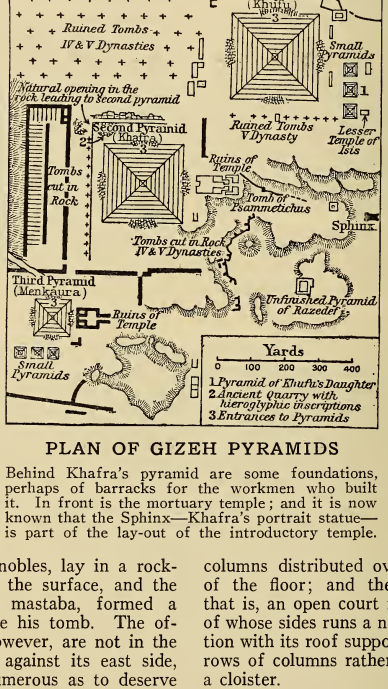
From Sir Flinders Petrie, 'Tarkan II'

early tombs this upper portion was missing or consisted merely of a heap of sand or a gravestone. As early as the First Dynasty, however, it took the form of a mastaba or small solid rectangular brick structure with a slight batter or slope to its sides, and a niche in one face, in front of which the offerings were laid. By the time of the Fourth Dynasty these simple buildings had developed into the great stone mastabas of the nobles by which the pyramids of the kings of the Fourth Dynasty are surrounded. Beneath the mastaba itself lay the tomb chamber, reached either by a staircase or a vertical pit. In the mastaba were the rooms, simple or elaborate, in which the food and drink offerings were laid.

In the case of the pyramid, however, the arrangements were slightly different. The king, like his nobles, lay in a rock-cut chamber below the surface, and the pyramid, like the mastaba, formed a memorial pile above his tomb. The offering chambers, however, are not in the pyramid, but built against its east side, and they are so numerous as to deserve the name of a pyramid temple.

A pyramid and its temple stood on a plateau a hundred feet above the level of the fields. In order to facilitate approach, a covered sloping passage was constructed, leading up from the plain to the temple, and at the lower end of this passage was built a small introductory temple. The so-called Sphinx temple at Gizeh is the introductory temple of the second pyramid, that of Khafra; the Sphinx attaches to this same pyramid and is, in fact, a portrait statue of Khafra. These early temples exhibit most of the features of later Egyptian religious architecture. They are all solidly constructed and roofed, where roofed at all, with horizontal blocks of stone carried on columns and without the use of the arch. Thus we have already in the Old Kingdom the two main features of Egyptian temple architecture — the hypostyle hall, that is, the hall completely roofed, the roof being borne on columns distributed over the whole area of the floor; and the colonnaded hall, that is, an open court round one or more of whose sides runs a narrow covered portion with its roof supported by one or two rows of columns rather in the manner of a cloister.

Of religious architecture of this period outside the pyramid temples we know nothing except from the sun temples of the Fifth Dynasty kings at Abusir.


Great Pyramid (Khufu)
Ruined Tombs IV & V Dynasties
Small Pyramids
Natural opening in the rock leading to Second pyramid
Second Pyramid (Khafra)
Ruined Tombs V Dynasty
Lesser Temple of Isis
Tombs cut in Rock
Ruins of Temple
Tomb of Psammetichus
Sphinx
Tombs cut in Rock IV & V Dynasties
Third Pyramid (Menkaura)
Unfinished Pyramid of Razedef
Ruins of Temple
Small Pyramids
Yards
0 100 200 300 400
1 Pyramid of Khufu's Daughter
2 Ancient Quarry with hieroglyphic inscriptions
3 Entrances to Pyramids

PLAN OF GIZEH PYRAMIDS

Behind Khafra's pyramid are some foundations, perhaps of barracks for the workmen who built it. In front is the mortuary temple; and it is now known that the Sphinx—Khafra's portrait statue—is part of the lay-out of the introductory temple.

STILL DEFYING THE RAVAGES OF NEARLY 5,000 YEARS: THE GIZEH PYRAMIDS FROM ALOFT

For the climax of pyramid building one must move on to the Fourth Dynasty, three of whose kings, Khufu, Khafra and Menkaura, built the famous group at Gizeh. In this air view looking westward into the desert that of Khufu of Cheops (the Great Pyramid) is the nearest; much the smallest, that of Menkaura in the background is yet a worthy member of the group by reason of its good preservation and perfect proportions. That of Khafra preserves some of its outer casing at the top. The comparatively tiny stepped pyramids are the tombs of royal relatives.

Royal Air Force Official, Crown Copyright

MESOPOTAMIA'S CITY STATES BEFORE THE RISE OF BABYLON

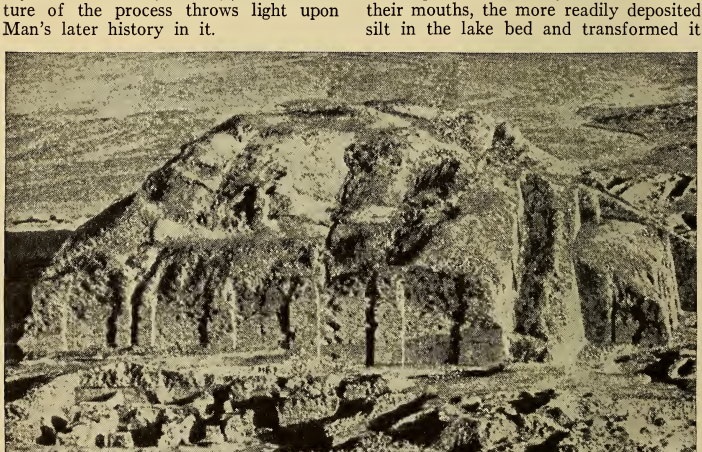
THE URGE OF LIFE IN THE EARLY SUMERIAN TOWNS ALONG THE BANKS OF THE TIGRIS AND EUPHRATES

SIR LEONARD WOOLLEY, Hon. Litt.D.

Director of the British Museum and University of Pennsylvania Joint Expedition to Mesopotamia; Author of 'Dead Towns and Living Men,' 'Digging Up the Past,' 'Ur of the Chaldes,' etc.

Mesopotamia is indeed the gift of the rivers. Originally a long arm of the sea, an extension of the Persian Gulf, it has been gradually filled up with the silt brought down by the Tigris and Euphrates, the Karun and the now dry Wadi Armak (al Batn); and the nature of the process throws light upon Man's later history in it.

The first stage seems to have been the forming of a bar across the gulf, below the river mouths; behind this there would have been a great lake, salt at first but made sweet in time by the passage of the waters from the northern streams. These, their speed checked by the bar across their mouths, the more readily deposited silt in the lake bed and transformed it



RUINS AT UR OF SHRINE OF THE CITY'S PATRON GOD

That the Sumerian's fully mastered their medium and could invest their brickwork with a rock-like solidity and a redeeming grace of line, is shown by the ruins of the great ziggurat, or temple-tower, at Ur, which is here seen from the air. A staged tower of this kind merely formed a pediment for a temple—that at Ur being dedicated to Nannar, the moon god. In the space before the ziggurat are crumbled remains of the buildings that clustered in the great temple enclosure.

into a series of marshy lagoons, developing into dry land at the northern end; while at the south end the bar, raised by the deposit of the lateral rivers, also became dry land, which gradually extended northwards until the two met.

The old gulf had now changed into a vast delta of clay and mud and sand, absolutely stoneless and flat, through which wound rivers so flush with their banks that they were constantly changing their courses—a delta diversified by marsh and subject to periodic floods, whose light soil could be parched by the summer sun to profitless desert, yet a land which, if drained and irrigated, could be made one of earth's most fertile places. If ever a land called aloud for human occupation it was this, and two races answered the invitation, the Semites in the upper half of the valley and the Iranians in the South.

Excavations at Tell el-Obeid near Ur give us a glimpse of one of the early southern settlements. Upon a low mound rising above the level of the flooded land there was planted a village, made up of little huts whose walls were of red matting stretched between wooden uprights and waterproofed with pitch or a thick mud plaster; their roofs were flat, of mud laid over mats supported by cross-beams, or else arched like those of many modern huts in the district in which bundles of tall reeds tied together serve instead of the wooden uprights, and the tops of each facing pair are bent inwards and lashed together so as to form a series of arches over which matting is laid. The huts had wooden doors whose hinge-poles turned on sockets of imported stone, and the hearths were either holes in the beaten mud floors or were built up with bricks of unbaked mud.

Cows, sheep, goats and pigs were kept, but the horse was unknown; the people grew barley and ground it in rough querns or pounded it to make a kind of porridge. They had copper tools—but these were luxuries—and small knives and saw-blades; the cutters of the threshing-machines, arrowheads and so on were chipped out from flint or chert picked up in the high desert, or from fine obsidian, like bottle-glass, imported from the Caucasus. Bone was used for awls and for net-making, axes were of copper or of polished stone, and stone was used for food bowls of the better sort.

BEAUTY OF OLDEST SUMERIAN POTTERY

Although produced without a potter's wheel, the prehistoric painted pottery from Tell el-Obeid (top) is remarkable for its graceful symmetry and excellent substance. The jars and mushroom-shaped table of offerings (below) from Kish, though much later (about 3200 B.C.), are actually inferior in technique.

Photos, Sir L. Woolley and Professor Langdon

But the most striking product of these early Iranians was their pottery. They had not learnt the use of the potter's wheel, but, turning the clay by hand, they had the skill to fashion vessels of really artistic shapes, admirably regular and sometimes so delicate that they can only be called "egg-shell ware"; and to decorate them with designs painted in black and red, which, though composed of simple elements, are masterpieces of ornament.

The villagers went on the marshes in boats with a canoe-like body and high

curled prow, and used nets for fishing; they wore garments of sheepskin or of homespun cloth, and there is some reason to suppose that they tattooed their bodies; their ears were pierced to take studs of stone, bitumen or baked clay, and the women wore heavy necklaces of beads chipped from crystal, carnelian and shell, and dressed their hair in a "bun" at the back of the head. When they died they were laid in the grave crouched up on one side, knees to chin, with the idea that as a man came forth from his mother's womb so should he go into that other world for which death was a rebirth; for since men placed beside the dead body vessels of food, personal ornaments and tools, the simple things that a man needs in this life, we can understand that they believed in a life to come wherein these would still be required.

Then came the Flood and overwhelmed the lower valley of the Euphrates. The cities, standing on high mounds, survived, but the villages perished, and the survivors were weakened in numbers and in morale. Into the rich and half-empty delta poured waves of invaders from the north and north-west—Armenoid peoples from the mountains of Asia Minor, Semites from the middle reaches of the Euphrates. They brought new blood and new arts, for they were users of metal and workers in stone, and while much that was characteristic of the older culture persisted, especially in the domain of architecture, the union of the three races meant the development of a new civilization. For the three did unite. It is in this period that we recognize for the first time the art which we can legitimately call "Sumerian," the creation of the hybrid Sumerian race which resulted from the mixture of blood.

BROUGHT TO LIGHT FROM THE DARKNESS OF SUMERIAN PREHISTORY

Close to Ur stands the ruined mound now called Tell el-Obeid. It covers the successive ruins of three temples, of which the earliest, by far the best preserved, was built by A-anni-padda of Ur's First Dynasty (c. 3100 B.C.). It stands on a platform and so must be reached by stairs. Above we see a portion of the façade as now revealed.

Courtesy of the Joint Expedition to Ur and of Dr. H. R. Hall

The outstanding illustration of what men could do in this period of amalgamation is given by a palace found on the site of the ancient city of Erech. That a great hall with rows of columns more than eight feet in diameter should have been built not long after 4000 B.C. is surprising enough, but when to sheer bulk we have to add the fact that walls and columns alike were overlaid with mosaics in elaborate patterns, we must needs acknowledge that a new spirit of creation had come into being.

Naturally, the process was not uniform throughout a country unorganized and split up into independent city states. In the north, closer to the land of their origin, the Semites tended to preponderate, and in the south the old Iranian stock was more pronounced; there were

ROMANCE AND TRAGEDY OF LONG AGO REVEALED BY THE SPADE IN UR'S DEATH PIT

The archaeologist, digging deep into the dust-heaps that mark the sites of ancient cities, is sometimes suddenly confronted by objects charged with a tragic interest At Ur, for instance, the outer chamber of a royal tomb (left photograph above) was revealed as a veritable death pit, for in this narrow space were found no fewer than 74 skeletons, grouped as in the plan on the right; six of them being of armed men-servants and 68 of women, all slaughtered at the same time to accompany their royal master to the land of the shades. *Courtesy of the Joint Expedition*

local schools of art distinguished by the predominance of one or other racial element. It needed an external force to impose unity. A fresh invasion of conquerors from the east crushed local independence and brought the whole river valley under a single king, and while the newcomers could contribute little to the civilization of the land they ruled they did secure artistic uniformity, and by knitting the country together made possible a common sentiment, so that out of the Sumerian race was born the Sumerian nation.

LADY OF THE COURT OF UR

One of the headdresses restored and mounted on a head molded over one of the female skulls found in the death pit at Ur.

Centuries had passed since the days of the old dwellers in the marsh, and one disaster after another had threatened to interrupt the process of artistic growth, yet beneath the surface that had been continuous. At Erech again there have been found in the ruins of a building dated to the close of the period of foreign oppression a number of stone vases which had been thrown out from a temple treasury. Some are magnificently carved in relief, others are in the form of animals or are decorated with animal figures in the round, and others again are enriched with inlay in colored stones and in mother-of-pearl; they are real masterpieces of early art. And with the emerging of the free Sumerian nation, when the invaders were put down and a native dynasty assumed control of the whole country, this art was to produce a glorious flower. From the ancient city of Asnunnak in the north (now Tell Asmar) comes a collection of stone statues which had been buried under a temple floor; carved with remarkable skill, they represent the different types of the people of the place with a power of characterization which anticipates the wonderful portrait sculpture of the Gudea times.

Nor is it by stone sculpture alone that we can judge of the first great age of Sumerian independence. The graves discovered at Ur have thrown a flood of light upon the achievements of the artists and craftsmen of the time. In the royal tombs, where the bodies of dead kings and queens were laid in domed or vaulted chambers of stone, constructed deep underground, the ritual of death has preserved for us such treasures as can be compared only with those of Egypt and of Mycenae. A Sumerian ruler of those times was accompanied to the grave by a whole host of followers, the ladies of his court, his officers, his servants, soldiers, grooms and musicians; all went down into the pit in which the tomb chamber had been built, and there, after some kind of service, drank a draught of poison and died, and the earth was flung in upon them. And the furnishings of such a tomb was in keeping with the sacrifice of human life that honored it; we find vessels of gold and silver, weapons of solid gold, harps and lyres enriched with mosaics and with precious metals, personal ornaments of

every sort, inlaid gaming-boards and animal figures wrought in gold and lapis lazuli. Treasures of this sort in gold and silver, bronze and shell, not only bear witness to the wealth and prosperity of the age, but, since the older graves date back as far as 3500 B.C., prove that civilization developed earlier in the Euphrates valley than on the banks of the Nile.

To illustrate a somewhat later phase of the same early period we have, instead of the peasant's hut of the prehistoric settlement, a king's palace and a goddess's temple. Of the two, the palace, discovered at Kish near Babylon, is the older, though again we cannot exactly reckon its age in years; the temple was built by King A-anni-padda of Ur probably about 3100 B.C. Kish was accounted by the historians of Babylon the first in order of time, as Ur was the third, of the great royal cities, and the title implies a change in the life of the country.

Though the settlement of the land took place, in all probability, by slow degrees, as small bands of adventurers pushed ahead into the drying marsh and perched their isolated huts or tiny hamlets on any island site that afforded safety from the floods, driven to a solitary life by the need for each squatter to cultivate his own patch of soil, yet the Sumerian seems to have been preeminently a town dweller. Today the whole Mesopotamian valley is strewn with "tells," the grave-mounds of dead cities. From the outset the process to which these mounds bear witness must have been at work; as conditions grew more favorable the settlers, rather than live lonely on the land, grouped themselves in villages, and the villages developed into towns.

After all, life cannot have been very secure in a new country where every individual and every community was consumed with land-hunger, when it was quicker to raid your neighbor's cattle than to breed your own, when the larger flocks needed wider pasturage and all the pasturage had been taken up already, and when every newly dug canal was a prize coveted by the community next door; there was safety in numbers, so the town was better than the hamlet. Experience had taught men that buildings largely made of unbaked mud bricks had to be raised above water level, raised, if need be, on an artificial platform, and that an earthen rampart was the best thing to keep out floods; common sense remarked that a rampart more sheerly built would keep out an enemy also, and so the town developed into a walled city.

The city was the political unit. Originally independent and self-sufficing, it owned as much land as its citizens had been able to secure, together with the villages and farms on that land whose inhabitants took refuge within its walls in time of stress. The most successful government was that which best upheld the rights of landed property, and since such rights were at the bottom of most quarrels with neighboring cities—and quarrels were frequent—the simplest course was to conciliate interests by uniting the cities. It was a policy likely to appeal to an ambitious governor, and as the classes that mattered were akin, so that there was no question of foreign control, and as the people asked little more than that their rights of property should be respected, and that they should be left to settle their domestic affairs themselves, imperialism ran counter to no principles. After the Flood the rulers of Kish, the invaders from the east mentioned above, were the first to secure hegemony over the whole country, and they held it, according to Babylonian stories, for countless generations. After Kish, a true Sumerian dynasty with its capital at Erech had its turn of overlordship, and then Ur.

The royal palace at Kish bespeaks a high degree of luxury. Built of crude mud brick over an artificial platform, it was approached by a broad flight of steps leading to a gateway set back in a decorated recess; an open court with a colonnade of brick columns gave light to the inner chambers, and brick columns also supported the roof-beams of the principal apartments. The walls were adorned with slabs of slate encrusted with figures in shell and mother-of-pearl, scenes of pastoral life or of the king's victories over his foes. Ruined as the building is, one can see that it was once a palace indeed worthy of a king.

The most interesting single object found at Kish is a small stone tablet with the earliest writing yet known in Mesopo-

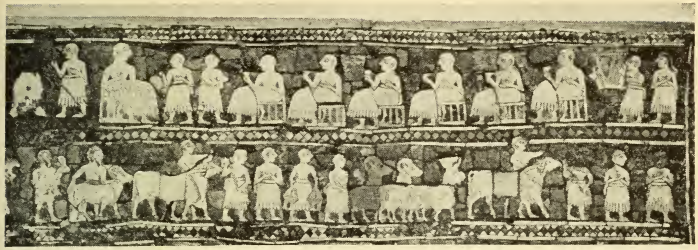
tamia. The signs engraved on it are drawings of objects—a foot, a hand and the like—and illustrate how in the beginning the Mesopotamian script was picture-writing.

The temple of A-anni-padda, which, like the much earlier village, was at el-Obeid, illustrates the splendor of religious life. Set on a high brick platform, it was approached by a wide flight of stone stairs —the stone laboriously imported from abroad—at the top of which stood a porch with columns and roofing timbers of palm-wood overlaid with copper; the door was flanked by life-sized lions of copper with inlaid teeth and eyes, its lintel supported by columns encrusted with a mosaic of red and black stone and mother-of-pearl, and above the lintel a great heraldic relief in copper (*see* plate opposite). The outer walls were adorned with rows of copper statues and reliefs of cattle, and with flower-rosettes of red and black and white, while higher up there were copper-framed friezes of delicate inlay work in shell or limestone against a black background, rows of birds,

INSIDE THE HOUSE OF A CITIZEN OF UR

The house at Ur shown in the lower photograph was built during the Isin-Larsa period (c. 2150) after the fall of the Third Dynasty, and has been preserved so faithfully that it can be reconstructed (top left). We see the open, brick-paved courtyard, which must have been surrounded by a balcony because of the pillar base and the stairway to an upper floor. The doors lead to living rooms and domestic offices. The roof was nearly flat, but sloped slightly inwards, leaving a small square opening in the center.

Photo, Sir L. Woolley; reconstruction, A. S. Whitburn; courtesy of the Joint Expedition to Ur



PRINCES AT THE FEAST 5,500 YEARS AGO

This plaque is made of shell, lapis lazuli and pink limestone mosaic set in bitumen, and was found in a royal tomb at Ur, dating from about 3500 B.C. It shows the royal family seated at a banquet, with their servants bringing sheep and oxen for the feast.

Courtesy of the Joint Expedition to Ur

HOW MEN AND WOMEN WERE CLOTHED IN THE EARLY DAYS OF SUMERIA

These figures from Lagash not only illustrate the engaging quality of early Sumerian sculpture, but show the styles of dress then prevalent in Mesopotamia. The unnamed royal personage on the left, of the earlier Ur-Nina period, is wearing the plain cloak reaching from left shoulder to feet, while the woman in attitude of prayer (center and right) displays the more elaborate female attire, with woven bands, that had come in by the time of Gudea. She wears a metal necklace.

British Museum and the Louvre

processions of cows, scenes of domestic life. Inside there were statues carved in stone and stone vases inscribed with the record of their dedication by pious donors.

If so much has survived the wreckage of five thousand years we can imagine the wealth which enriched the temple in its prime. We have here proof not merely of barbaric luxury, but of high technical skill on the part of the craftsmen of Ur, and of high artistry to inform it.

The age which followed was one of political turmoil; one city state after another, some with Sumerian dynasties, some with Semitic, gained the dominion of the whole land by force of arms or disputed it with rivals too equally matched to submit to vassaldom. Yet it was an age of progress also. The armies which won for their master the suzerainty over the home country had still to be employed thereafter, and could be turned to foreign conquest. To the east the old enemy, Elam, had to be crushed time and again, and a Sumerian governor might administer the law in Susa; to the west the soldiers would raid as far as Syria, so that a king of Sumer and Akkad could set up his trophies at Diarbekir and wash his feet in the waters of the Mediterranean sea.

And these adventures did not only open men's minds to new ideas and a wider outlook; their result, and to a large extent their motive, was the extension of trade. Rich as was the great valley of the Two Rivers, its whole wealth lay in its agriculture and its pasture lands; for fine timber, for all metals, and for such luxuries as precious stones, in fact for stone of any sort, it had to depend on imports, and its prosperity was, of course, enormously enhanced when it controlled the trade routes and the sources of its foreign needs.

And there was another result of this troubled period not less important. Anarchy meant violence and corruption in high quarters and the oppression of the poor.

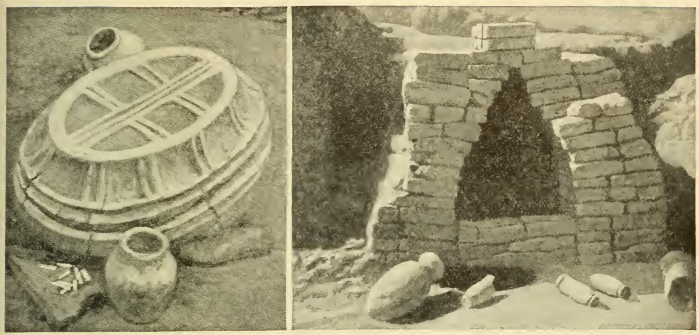
When a ruler had succeeded in establishing his authority over the land by force of arms the best way to secure his position was to win popular sympathy by righting wrongs and reinforcing the law; this involved the enactment of new statutes and the reduction into legal form of customs and traditions, so that when at the end of our period Hammurabi compiled the great code of law of which the well-nigh complete copy is preserved in the Louvre, he was able to draw upon a number of partial codes whereby previous rulers had sought to reform the abuses of their day.

The prosperity that might attend a time of peace is well shown by the records of Gudea, a governor of Lagash after that town had lost its suzerain powers. Only once does he mention a war, and that was with the foreign state of Anshan; but he talks much of his buildings and pious foundations, and the wealth which he lavished on these proves not only his piety, but the flourishing condition of his state. He encouraged foreign trade and was a patron of the arts. There are sixteen statues of him extant today, one of which shows him as an architect holding groundplans and measure, and he won divine honors from a grateful people.

The establishment of the Third Dynasty of Ur about 2400 B.C., by Ur-Engur (or Ur-Nammu, as his name is now more accurately read), once more brought the whole of Mesopotamia under one rule and guaranteed peace and decent government. For the era which follows the historian has far more material at his disposal and can study in much greater detail the life of the people. Not only are written records now more or less continuous, but the excavations at Ur of the Joint Expedition of the British Museum and of the Museum of the University of Pennsylvania have brought to light many of the buildings and monuments of the capital city and give us an idea of the setting of life.

At the head of the state stood the king. The theory of the old city state had been that God—the particular god who was the city's patron—was really king, and that the human being who was called king or governor was his vice-regent; and this theory was never forgotten, but it might lead to difficulties when the city state no longer stood alone. If the men of Umma conquered Lagash it was the victory of the goddess Nisaba over Ningirsu, the god of Lagash, and rebellion against Umma would have the extra sanction of religion.

When one city, Babylon, had main-



HOW THE SUMERIAN DEAD WERE INTERRED BENEATH THEIR HOUSES

Two methods of burial existed side by side in Sumer, and it is hard to see what dictated the adoption of the one or the other, except family tradition. A man was either buried between mats with a clay coffin shaped like a bath tub (left) inverted over him, or else laid under the house-floor in a corbelled vault of brick such as that on the right; in the latter case the tomb was used repeatedly. Both the examples above are at Ur.

From the Antiquaries' Journal

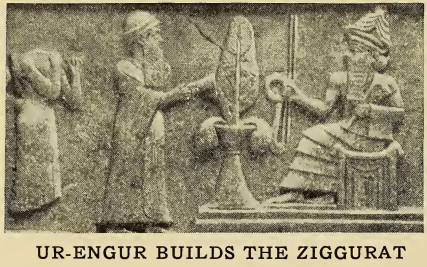
tained its supremacy sufficiently long, it could so tamper with the religious legends which were common to the whole land as to legalize the pretensions of Marduk its god to the headship of the pantheon, and thereby eliminate one great motive for discontent; but with the earlier and more ephemeral dynasties that was impossible, and a simpler solution was devised. The king was deified, and each city under his sway could then combine its traditional worship with that of a new god common to all the country, the favorite, the adopted son or the husband of every local deity. Thus, though God was king, the king was also god.

Below the king society was divided into three classes. At the top came the *amelum,* or freemen, apparently the whole body of clergy and government officials, then the *mushkinum,* freemen but of a subordinate type, the poorer middle class, and at the bottom of the scale the *wardum,* or slaves. The distinction was a very real one. Thus, in a case of assault, if the victim were an *amelu,* the punishment was an eye for an eye and a tooth for a tooth, whereas, were he a *mushkinu,* a fine would settle the matter; but, conversely, the guilty party was punished more severely if he were an *amelu* than if he belonged to the middle class, and a doctor would legally charge him twice as much as he would a *mushkinu* and five times as much as for a slave.

In every department of life the freeman of the official class possessed privileges and was subject to responsibilities which marked him off from the freeman of the second grade, but the difference between freemen of either grade and the slaves was primitive and fundamental. The slave was the absolute property of his master, whether he were captured in war, bought, or born in service. He could buy or be given his liberty, and he could legally protest against being sold; but to harbor a runaway slave was a very serious offence. He was branded, and he wore a distinctive dress, and if he suffered personal injury at the hands of a third party the compensation was paid to his owner.

If he enjoyed certain safeguards and privileges—he might own land or property and could give evidence in a law court—it was perhaps out of consideration for the higher grades, for a freeman might hand over his wife or son as a slave in payment of a debt; or, again, a free woman might marry a slave, and the

fact of his having certain rights would make her position easier. Babylonian slavery was probably of a fairly merciful sort, but the social gulf between freeman and slave was not lessened thereby.



UR-ENGUR BUILDS THE ZIGGURAT

In this stele set up by Ur-Engur, founder of the Third Dynasty of Ur, the king is seen pouring a libation and receiving instructions from Nannar, the moon god, to build the great Ziggurat and shrine of Ur. The god holds measuring rod, cord and adze.

Courtesy of the Joint Expedition

The form of government was essentially personal, derived from the king, who appointed the necessary officials but was himself the fountain-head of law and the final court of appeal. The law of the land was for the most part traditional—that is, common law based on precedent, supplemented by royal edict. It was administered by local judges and by the clergy.

In the old days of the city states the governorship of a city—which might rise to kingship—was hereditary in the chief family of the place; and even under the centralized rule of Ur that might still be so, the supreme authority preferring to interfere as little as possible with local tradition and to utilize the existing machinery of government. The *ishakku*, or governor, was responsible for the public works of his area; saw that the taxes were duly collected by the tax-farmers and the imperial dues forwarded to the capital; supervised the administration of justice; circulated the royal decrees; sent on legal cases of appeal; and carried out special orders of the king.

The building or restoration of a temple was always regarded as the act of the king, and another important duty of the ancient king was the upkeep and the extension of the irrigation system. The whole agricultural prosperity of the land depends on its water, and the making of a new canal or the cleaning out of an old one was a public service meriting due record.

The chief officer of the imperial service was the superintendent of the armed forces of the crown. He arranged the levy of troops, was head of a body which seems to have corresponded to the police, and further settled the calling up of levies for the great public works, most of which were carried out by corvée labor. In the field the king himself, as war-lord, took command of the army. There was no cavalry, the horse being yet unknown in Mesopotamia; light troops were armed with the bow and the throwing-lance; the main body carried lance, axe and sometimes a mace or warclub; for shock tactics there was a deep phalanx composed of footmen protected by leather helmets and enormous square shields and armed with very long, heavy spears.

'SIGNATURE' OF A SCRIBE

To the Babylonian his seal was what a man's signature is today. It took the form of an engraved cylinder which, when rolled over a tablet, left on the wet clay an impression of the owner's emblem—usually a group of gods, as in this impression from the seal of Adda the scribe (c. 2500 B.C.).

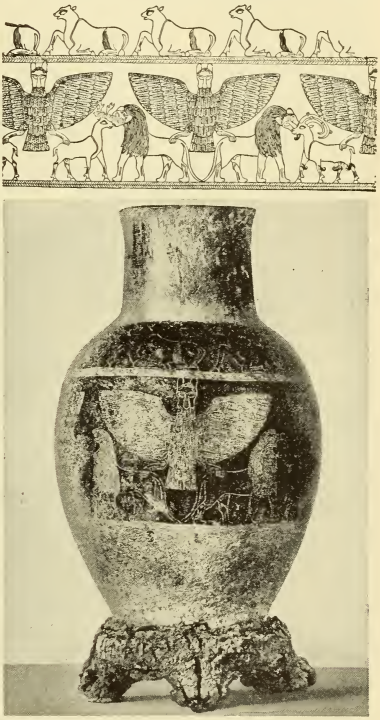
British Museum

All weapons were of copper. The senior ranks and the main fighting force, probably the heavy-armed men, were recruited from the *amelum,* the upper class of society; the *mushkinum* performed camp duties and may have composed the light arm of the service; slaves were exempt from military duties altogether. On retirement from the army soldiers could receive grants of land which was inalienable provided that it was duly cultivated, and free from taxation; the possession of such land may have carried with it the obligation to further service when required, and in that case we should have a custom not unlike that of the fief granted to a knight in medieval Europe. Soldiers captured in battle by an enemy were ransomed, and if their own means were insufficient for this the local temple, or, failing that, the State, had to find the money.

Apart from the army superintendent there were numerous palace functionaries, some of whom were household officials, while others had duties which took them farther afield. Such were travelling inspectors, judges, irrigation officers, architects, treasurers, secretaries and keepers of the archives; while of the more domestic sort were the chamberlain, the managers of the royal estates, the master of the harem and the directors of livestock, dairy-work, factories, fishing and donkey-transport. Most of these offices were duplicated in the great temples, where the household of the god was organized on exactly the same lines as that of the earthly king.

Now let us look at the material setting of the life thus organized by the State. Although agriculture was necessarily the mainstay of Babylonian prosperity, yet social life was essentially urban and the very forms of government envisaged rather a town-dwelling folk. The farm-laborer might still live in a hut of wattle and mud daub or under the goats'-hair tent which shelters his descendant at the present day, but business centered in the towns; even the big landowner would have his town house as well as his country estate, and in towns the standard of living advanced far beyond the mud hovel.

In an alluvial land like Mesopotamia, where there is no stone whatsoever, the only building material was brick, either crude mud bricks or bricks properly kiln-fired; but with such the Sumerian architect could produce buildings hardly less permanent or splendid that the stone temples of Egypt. Dispensing with ornament for the exterior, he relied for his effect on mass and line, strength and har-



SUMPTUOUS SILVER VASE

Babylonian pottery was mostly plain and uninteresting, but the metal-work could be magnificent. This splendid silver vase for King Entemena (c. 2950 B.C.) shows Imgig, the heraldic lion-headed eagle of Lagash, with lions, bulls, stags and goats (see details above).

The Louvre

BABYLONIA'S FIRST WELL KNOWN KING

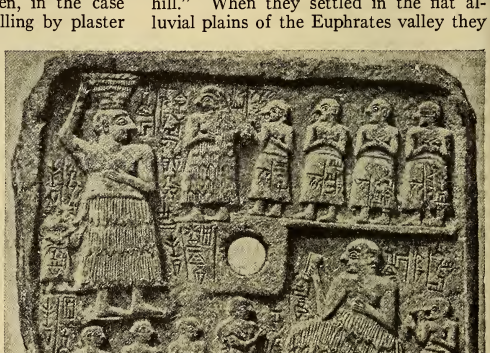
Ur-Nina, king of Lagash, is the first real personality to emerge in Babylonian history. He stands here wearing the Sumerian flounced 'kaunakes' imitating a sheep's fleece, with his butler, Anita, and a group of his sons.
From the Louvre

mony of proportion taking the place of mere decoration; for the interior the bare brickwork would be hidden, in the case of a humbler private dwelling by plaster and whitewash, in a temple sanctuary by wooden panelling or by a costly mosaic of gold and silver, crystal and lapis lazuli, turquoise and carelian.

The buildings of Ur spread over a very large area, nearly four miles by a mile and a half, but the greater part of this was accounted for by suburbs lying outside the city. The latter, measuring something more than half a mile in length by a quarter of a mile in width, was enclosed by a massive brick wall, the work of Ur-Engur in 2400 B.C. Inside this again was another great enclosure measuring 400 yards by 200, the *temenos* (to adopt a Greek term), or sacred area of the city, wherein stood all the principal temples, the whole dedicated to the moon god Nannar, the patron of the town.

On a high platform in the west angle of the temenos rose the most conspicuous building of all, the *ziggurat*, or staged tower, whereon was set the moon god's central shrine. Every great Sumerian city boasted such a tower, erected in honor of its local god, the most famous and the largest of all being that of Marduk at Babylon, which has come down to us in story as the Tower of Babel. The Tower of Babel is today completely destroyed, but that of Ur, built on much the same pattern, is fairly preserved, and the description of it might well stand for that of other ziggurats, too.

The reason for the ziggurat seems to be that the Sumerians were by origin a mountain folk, whose gods would be gods of the hills, and they were accustomed to "high places" and to setting up their altars "on every high hill." When they settled in the flat alluvial plains of the Euphrates valley they



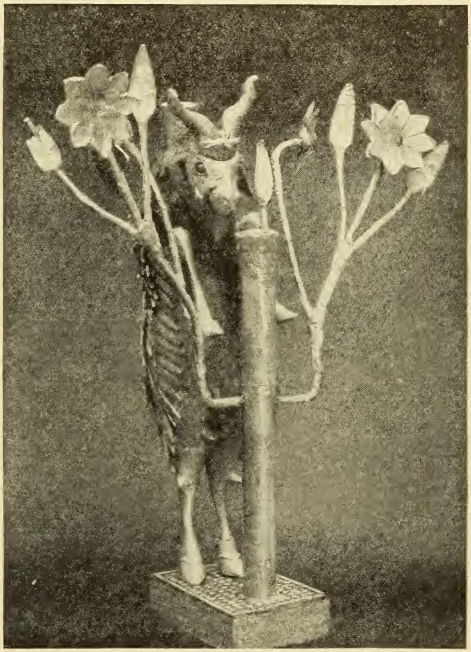
RULER ATTENDED BY HIS FAMILY

With a minister, conventionally represented as being of insignificantly diminutive stature, standing behind him, Ur-Nina, a despot of Lagash (c. 3000 B.C.), is represented receiving his children on two occasions. One of them is a princess, but her clothes are not to be distinguished from her brothers'.
The Louvre

must have been sadly at a loss for a place where their god could be worshipped according to tradition, and so set to work to repair the deficiencies of Nature by building artificial hills, easily impelled thereto by the real need which there was of raising every building on some kind of platform to secure its foundations against the periodic floods. The whole area within the town walls was raised above the irrigated plain, and each temple within the temenos stood on its own platform; but the ziggurat was something more than this. A mass of solid brickwork, with a base measurement of over 200 feet by about 150, it rose, with slightly insloping sides and receding terraces, to a height of seventy feet, and it was upon this huge base that there was built the actual shrine.

On the north-east side three wide brick staircases, one coming right forward from the tower's face, the other two leaning against its wall, met in a gateway on the level of the second terrace and made a wonderful stage for the religious processions such as took place on the feast days of the god. It was vastly impressive, and we need not wonder that "the Mountain of God," or "the Hill of Heaven," was remembered centuries later in the legends of an alien race whose ancestors had once lived under its shadow and watched the solemn priests pass up and down its stairs.

Below the foot of the ziggurat stretched a great courtyard surrounded by a range of store-rooms, the main entrance passing beneath a two-storied building where the officials lived and worked; it was probably the receiving house for the temple dues. The god was a great landowner, and since coined money was unknown the tenants of his estates paid their rent and tithes in kind; storage room was, therefore, needed on a large scale. The farmer would bring in grain and oil, cheese and clarified butter (the cooking butter of the East), wool and hides and hemp and flax; the townsman would bring, according to his trade, scrap copper, cloth, gold or manufactured goods; and close by there was a quay at a canal-head where the ships would come from over sea with cargoes of timber and stone, gold and copper ore, precious stones and incense



THE "RAM" CAUGHT IN A THICKET

Among the most remarkable objects disinterred at Ur were two figures of so-called "rams," (actually goats) so well preserved that this restoration has been practicable. The fleece is composed of shell and lapis lazuli encrusted on a wooden core and the plants of wood overlaid with gold.

Courtesy of the Joint Expedition

gum destined for the temple. And all these had to be checked and weighed and stored. A whole staff of secretaries and scribes was required for such work; for everything brought in a receipt was given, written on a tablet, and a duplicate copy of the receipt was filed in the temple archives.

This court lay at the extreme end of the sacred area. Beyond it came the temples proper, the temple of the moon god himself on one side of the ziggurat, occupying part of the same platform, on the other side that of Nin-Gal, his wife; and next again was the shrine common to the two—the "harem" as it were, of the god.

In all these there was no uniformity of plan. The "harem" temple was a little

OUTSTANDING EXAMPLE OF SUMERIAN SCULPTURE

The admirable quality of Sumerian sculpture is exemplified in this head of the goddess Nin-Gal. It is of white marble with the eyes inlaid in blue lapis and white shell, giving an uncannily lifelike effect.

Courtesy of the Joint Expedition

five-roomed sanctuary hidden away in the center of a block of storerooms and service chambers; the Nannar temple consisted of a small shrine with flanking chambers all opening on to a central court. Far more elaborate was the temple of the moon goddess, Nin-Gal. This was built like a fortress, with heavy outer walls and defensive towers, and contained two distinct temples and several minor shrines. Different again was the adjoining shrine, Dublal-Makh, whose simple two-roomed sanctuary faced on a great open court, entirely surrounded by a range of chambers wherein the written archives of the temple were stored and all sorts of trades carried on. This sacred enclosure was not a temple in the normal sense of the word; rather it was like a medieval monastery, wherein, besides the great church and the many subordinate chapels, there were buildings of a more secular sort covering a far larger area—dormitories, store-houses, refectories, workshops and libraries. Here, too, there had to be quarters for the priests, for the temple servants and for the women attached to the service of the god, as well as for the children who were educated in the building.

Moreover, we have seen how into the temple precincts the god's tenants brought in kind their dues and offerings. These had not only to be stored, but to be turned to account. Thus the women spun the wool into yarn and wove it into cloth; the raw copper was melted and cast or hammered into vessels; the metal and precious stones were used for making statues or adorning the shrines, and all the people so employed, as well as the priests, had to be clothed and fed. This meant yet more clerical work, for everything was done most systematically. We have found thousands of tablets dealing with the stores, since for everything given out there was drawn up and filed an issue-voucher stating names and quantities, the purpose of the issue and its authority, duly signed by the two parties and the witnesses. Other tablets deal with the factories, both those on the temple premises and the private factories which contracted for the temple work.

All this gives us a remarkable idea of the business-like methods of the ancient Sumerians, and such methods were not confined to the temple, but pervaded every activity of life.

No business transaction was really legal unless it was recorded in writing. Deeds of sale, leases, loans, marriage contracts, deeds of partnership and their dissolution,

contracts for building or anything else, as well as all decisions of the courts of law, were entered in writing. In every legal action appeal was made to "the tablet," nor was it easy to maintain a claim without its evidence; only where in the nature of the case written proof was impossible an oath was taken in the name of the gods and of the king. As a general rule, therefore, for greater security, copies of the tablets were registered in the temple —often enclosed in clay envelopes on which an abstract of the contents was inscribed—and so many have been preserved that precedents could be quoted for almost every kind of case.

The great complex of religious buildings which housed so many and different activities was laid out on spacious lines, with broad courts and open spaces, massive walls and terraces, culminating in the ziggurat, and all enclosed within the fortified circuit of the temenos. But outside the temenos wall lay the city proper, and here conditions were by no means the same.

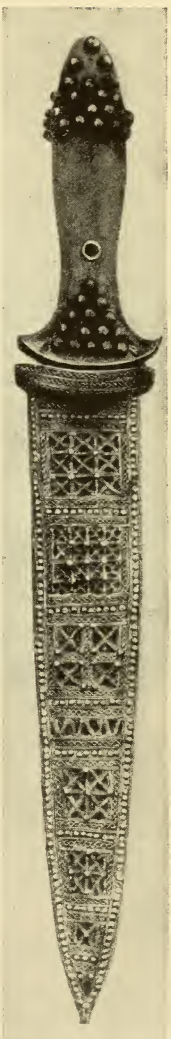
So far as we can see there was little attempt at town planning. There may have been a few broad and straight streets converging from the city gates on the temenos enclosure, but for the most part narrow and crooked lanes wound between the blank walls and doorways of the huddled houses. At a sharp corner the brickwork might be rounded off so as to make the passage easier for the passer-by, but the streets were for the most part unpaved and rough—in wet weather regular gutters wherein the mud lay deep—and probably none who owned donkeys would choose to go abroad afoot.

By 2000 B.C. a type of middle-class house had been evolved which in almost every detail anticipated the well-to-do house of modern Baghdad. The front door led through a small lobby into a central courtyard, off which opened the rooms of the ground floor and the staircase going up to the upper story. Facing the entrance was the reception-room to which guests would be taken; on one side would be the kitchen with its mud fireplace and perhaps one or two rooms for the servants; under the return of the stairs was the little tiled lavatory; in some houses there was also on the ground floor a private chapel, a long narrow room with raised "chancel" and altar, beneath the pavement of which lay the family burying-vault. In the central court upright posts set near the angles supported a wooden balcony, which ran round the interior of the house; the eaves of the house roof were prolonged so as to shelter this, and only a square opening was left in the middle to supply light and air to the court. The stairs led to the balcony, and on to this opened all the upper rooms, the plan repeating that of the ground floor; these upper rooms were probably the living quarters of the family. Of course, the poorer houses were smaller than this and often only one storey

UR'S ASTOUNDING CRAFTSMANSHIP

Archaeology has shown that there must be some truth in the legends that speak of kings hundreds of years earlier than the First Dynasty of Ur (c. 3100 B.C.), for this gold dagger, with a lapis lazuli handle, in a filigree sheath of gold, is but one of many articles of splendid craftmanship that date from 3500 B.C.

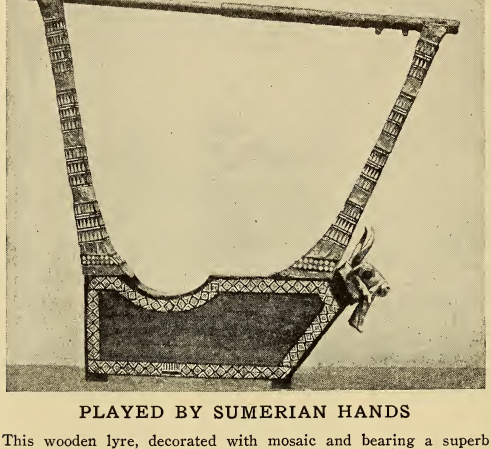
Courtesy of the Joint Expedition to Ur



high, while a wealthier citizen might boast a house with two courtyards each surrounded by its range of chambers.

Windows, on the ground floor at any rate, were very few and gave on the central court, never on the street; the desire for privacy seems to have been as strong in the ancient as in the modern East. Generally there were no windows at all on the ground floor, the rooms deriving all their light and air from the high doorways, an arrangement well suited to Mesopotamia, with its glaring sun and excessive summer heats. The roofs were flat, made of palm-logs covered with matting and reeds, with mud plaster above—the normal roof of the modern Mesopotamian house, cool in summer and remarkably rainproof in winter.

Over the floor were spread mats exactly like those used at the present day, and in the richer houses rugs and carpets. Stools and chairs with wooden backs and arms had rush-bottomed seats and sometimes castors of copper or silver; beds with string mattresses stretched on a wooden frame, wooden chests for storing clothes, and low tables, generally tripod-shaped, completed the simple fittings of the rooms. At night illumination was supplied by a primitive lamp, an open saucer wherein a wick floated on the oil. Water had to be fetched from the public wells outside, but almost every house would have its own drain.



PLAYED BY SUMERIAN HANDS

This wooden lyre, decorated with mosaic and bearing a superb bull's head in gold, was found in a grave at Ur with two other lyres. Though crushed with the earth of 5,000 years, and with its frame in powder, the mosaic was still in place and thus accurate restoration by modern methods was possible.

Courtesy of the Joint Expedition to Ur

It was the custom to bury a dead man beneath the house in which he had lived, either in the chapel or, if the house did not possess one, below the floor of any of the rooms. The pavement was lifted and a hole dug, and, when the grave was complete and the funeral rites over, the flooring was relaid and the room continued in use. Strange as this may sound at first, it is not very unlike the habit, common until recent days in England, of burying below the church floor.

Of graves there were two sorts, the clay bath-shaped coffin and the brick-built vaulted tomb. The dead man, wearing his ordinary clothes and wrapped in a mat or in a linen winding-sheet, was laid on a mat, his head resting on a fringed and tasselled cushion, his body on one side with the legs bent up and the arms also bent so that the hands came in front of the face. Between his hands was set a little vase or bowl of water; with him might be put such small personal belongings as he might need in the next life—a dagger, a razor, or, for a woman, her necklaces and bangles. Then the clay coffin was inverted over the body, or the door of the tomb was bricked up; outside were placed vessels of food and drink, and the earth was filled in.

The brick tombs were family vaults and as such were constantly re-used (we have found as many as ten skeletons in one grave); and, coming as they did immedi-

ately below the floor of the room, they must have been very insanitary. Indeed, the wide extent of the ruins of the ancient towns may in part be accounted for by this practice, for a house, or a whole quarter, may at times have become uninhabitable and the inhabitants have moved elsewhere until Nature had purified their family graveyard.

In the earliest times the men wore a sheepskin with the fleece outside, tied round the body below the armpits. The locks of the fleece were twisted into rows of formal tassels; very often this garment, which became the traditional dress for ceremonial use, was imitated in woven material. Later the costume grew more elaborate, and the men of the better class wore a shirt, and over that a long cloak cut coat-fashion with full sleeves and fringed edges, while the workman contented himself with a short skirt fastened by a belt round the waist. A knitted skull-cap was used by the poorer people; the rich wore over this a turban coiled smoothly round the head, or sometimes, apparently, a headcloth kept in position by a twist of rope.

The king had the privilege of wearing a long beard, carefully combed and curled, somewhat after the fashion of the gods as they were portrayed in their statues; and his hair, too, was allowed to grow down over his shoulders. People of the lower class, the mushkinum and the slaves, wore a natural short beard and the hair was only long enough to make a heavy roll along the back of the head; but the priests were clean-shaven as to both chin and head, in the interests of ceremonial purity.

Women in the early period had a two-piece-costume consisting of an undergarment reaching to the feet and a long-sleeved coat which hung straight from the shoulders to the ground, fastened at the shoulder with a straight pin of copper; this continued long in fashion, but for ceremonial occasions a complete dress with full sleeves was worn, very wide in the skirt, made in a series of flounces of curiously early-Victorian style. The coiffure of the women was elaborate. The hair was crimped in front, so as to form a wavy band across the forehead, and long curls hung down in front of the shoulders. On the head was worn a sort of fillet—a ring perhaps of twisted cloth, perhaps of metal—and the back hair was either allowed to fall down the back in carefully curled strands or was coiled up and passed through the fillet so as to make a "bun" with a fringe below.

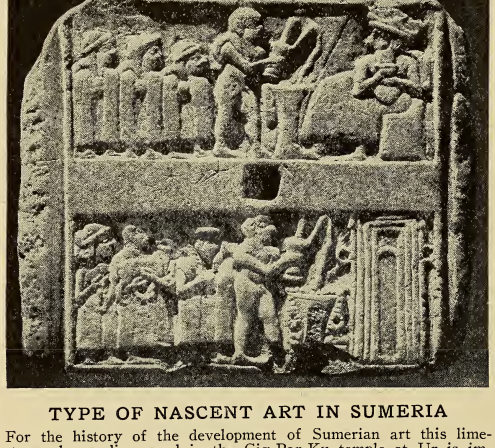
In a public place a woman would cover her face with a veil. The outer garments were generally of dark color, brown, blue or black, the inner white, except for fes-

THE AFTERMATH OF BATTLE

Apart from their helmets and shields, soldiers had no protective armor, wearing only a short kilt of hide. On this fragment of the Vulture Stele we see two of Eannatum's army about to bury a heap of slain comrades; the enemy dead were left to the vultures—hence the stele's name.

The Louvre

tival occasions, when only white was worn; but this sober attire was varied to some extent by the colored fringes on the veil and cloak. The women wore quantities of beads, often a high "dog-collar" round the neck, and simpler strings on the wrists, and on the necklaces were various amulets and charms. Both men and women wore shoes or sandals of leather, but these were for walking abroad only; in the house they went barefoot.



TYPE OF NASCENT ART IN SUMERIA

For the history of the development of Sumerian art this limestone plaque discovered in the Gig-Par-Ku temple at Ur is important. It shows scenes of sacrifice to the moon god Nannar, and its style dates it back to about 3000 B.C.

Courtesy of the Joint Expedition to Ur

Every Sumerian freeman, and many womenfolk, carried a seal. Where all business transactions were recorded in writing and most of the commonalty could not write, the seal was indispensable for attesting documents; its impression on the clay tablet was equivalent to the owner's signature. In the time of the Third Dynasty of Ur the seal was invariably a cylinder from three-quarters of an inch to an inch and a half long, made of stone and engraved usually with a scene in which the owner was shown being introduced by his patron deity into the presence of the city's god; his name and titles might be inscribed behind the god's figure. The cutting of some of these is exquisite, making of them veritable works of art in miniature, and they might well rank as jewelry; indeed, they were sometimes strung with ordinary beads as ornaments of a necklace, but usually they were mounted on a metal axis for easier rolling and carried singly on a string round the neck or wrist.

Most of the household vessels were of clay, and of such there was a great variety of shapes corresponding to their various uses. All were absolutely plain, the painted pottery of the prehistoric period having long since fallen out of use, and all except the largest and coarsest store-jars were made on the potter's wheel. In the wealthier houses there would be a few small vases, drinking-cups or bowls, made of glazed frit with designs in white and yellow on a blue ground. More common were vessels in metal or in stone, open bowls for the most part, which for ordinary use were of copper or of white limestone, diorite or shale. But here luxury had a wider scope, and we find beautifully fashioned vases of soapstone, granite, coral-limestone and calcite ("alabaster"), sometimes decorated with carved reliefs, processions of human figures, battle-subjects and animals.

Occasionally the effect of the carving might be enhanced by inlay in mother-of-pearl, shell or lapis lazuli, while the silver vase of King Entemena, engraved with heraldic eagles, lions, stags and goats (now preserved in the Louvre, see photograph in page 225), illustrates the treasures of the goldsmith's art which adorned the royal table.

Indeed, there is plenty to show that if the organization of society had been developed to a pitch unequalled except in modern times, its amenities, too, were not to be despised.

By 2000 B.C. the art of sculpture had had a long history, and had reached its maturity in the spacious days of the Third Dynasty of Ur. From the ruins of that city have been unearthed masterpieces of sculpture which more than fulfil the promise given by the statues fashioned for Gudea of Lagash a hundred years earlier. The great stele of Ur-Engur, the marble head of Nin-Gal with its inlaid eyes, the diorite head of the same goddess—these are the products of a finished art such as need not fear comparison with the finest work of Egypt.

In other arts the Sumerians of this period were far advanced. It is true that the vast bulk of the written documents which have come down to us are of a non-literary sort—business records, letters, legal decisions, contracts and so on; but a people who wrote so much must needs have had a literature of their own, and some idea of what this was like we can gather from the surviving tablets. Almost all of these are of a religious nature.

STEWARD OF THE GOD

This stone portrait figure, supposed to represent Kur-lil, 'Keeper of the Granary of the Temple of Erech,' is a fine example of Early Sumerian (Ur-Nina) art of about 3000 B.C.

British Museum

BRILLIANT SUMERIAN SCULPTURE

The poise of the head and suggestion of deliberate movement in this statue of a bull from Tell el-Obeid show that the artist who carved it was a most intelligent observer and a craftsman of genius. It is of wood, encased in copper plates.

Courtesy of Sir L. Woolley

Even in the minor arts we can see the high standard of the age. The little moulded clay figures of gods and their worshippers—the "teraphim" of the Old Testament—which are very common under the Third Dynasty, show a variety of subject and a freedom of treatment which are unknown later, and the modelling is sometimes quite masterly. Most of these figures are religious, but some—clay rattles, miniature vases, chairs and tables, little animals and so on—may be children's toys. They look like them, and we know that games were common then as now. Children tossed knucklebones as they do today; there was a draught game, the squares generally scratched on a brick, and another game more like "fox and geese," played with

GODS OF THE HOMESTEAD

Religion was a very personal affair in Babylonia. In Genesis we read that Rachel stole the images or 'teraphim' of Laban, and just such intimate little household gods, well modeled in clay, are found in great numbers on the site of Ur.

Courtesy of the Joint Expedition to Ur

counters and dice. For the elders there was hunting in the desert and in the marsh, dancing, and at certain times of the year miracle-plays performed in the temples.

Perhaps the best proof that Sumerian civilization was not merely well organized materialism but had a moral value of its own is given by the position it accorded to women. The betrothal gifts, it is true, which the future husband had to make to his prospective father-in-law originated with a system of marriage by purchase; but that custom had long died out. Though the husband was still legal head of his house and possessed certain rights over his wife which offend our sense of decency—in payment of debt, for instance, he could hand her over to the creditor for a maximum space of three years, just as he could his child—yet the wife was by no means the chattel which oriental society has so often made her.

Monogamy was the law, though, if the wife were barren, the man could take a second wife—but she would have a status inferior to that of the first. Or he could divorce her, giving her her dowry and, in addition to it, a sum of money proportionate to his rank. Or, again, she might give him one of her slaves to be his concubine, as Sarai gave Hagar to Abraham, the concubine acquiring her freedom as soon as she bore a child, though her old mistress could reduce her to slavery again if she attempted to become in any way her rival. Certainly divorce was easy for the man, but if there was no fault on the woman's side she retained her dowry, enjoying the custody of her children, received from her husband's estate a maintenance grant for their benefit, and after they had reached their majority was free to marry again if she wished.

If neglected by her husband, a good wife might legally return to her father's house with her property; if deserted, she might resume her freedom and remarry at pleasure. She was mistress of her own estate: the dowry which she brought to her husband's house was her own till her death and then descended to her children, or, failing them, went to her father's family, not to her husband. She could embark on business and buy and sell without her husband's permission, could take out a license for dealing in spirituous liquors, could give evidence in the law-courts; and if she married a slave, not only did she retain her freedom, but her children also were free.

The religious life also was open to women. They could become professional musicians or the like, or they could enter convents, taking vows of chastity—and the post of head of a convent was considered worthy of a king's daughter. Others might join the ranks of the religious prostitutes—and this was no degraded calling, for it really meant that a woman attached herself to the service of the god's house and made to him the most costly sacrifice in her power, that of her own body. Such devotees, for instance, enjoyed special rights of property and were free to marry at the end of their term of service.

Under the Third Dynasty of Ur, the civilization of Sumeria reached its high-water mark. Materially, it was unequalled by anything that was to follow it, until such time as European culture invaded Asia; socially, its organization was never afterwards surpassed in the Near East. Its moral ideals were proportionately less developed, yet out of them, on alien soil and among a strange people, were to grow the Law and the Prophets.

LIFE IN EGYPT DURING THE MIDDLE KINGDOM

A GLIMPSE OF THE EGYPTIAN AT WORK AND PLAY UNDER THE PHARAOHS OF THE TWELFTH DYNASTY

T. ERIC PEET

Formerly Professor of Egyptology, Liverpool

THE Middle Kingdom of Ancient Egypt, consisting in its strictest interpretation of the Twelfth Dynasty, 2000 to about 1788 B.C., is generally described as the Feudal Age. By this it is meant that the structure of society during that period is similar to that of feudal Europe in the Middle Ages. At the head of the state stands the king, still in theory the source of all power, the chief priest of all the gods and the sole lawgiver. But under him are the various local chiefs, dependent on him for the tenure of their land and owing him allegiance, but enjoying almost complete freedom each in his own district or nome. It was clear, however, that, nominally at least, the nomarchate, whenever it fell vacant, was in the gift of the Pharaoh, though it would probably be very difficult for him to deny the legitimate claim of the legal heir.

As in the Old Kingdom, the crown still possessed financial rights in every district, and taxes were collected by officials of the central treasury. In all matters, both administrative and judicial, the vizier served as the king's chief minister. Of the actual methods by which justice was administered we know no more than under the Old Kingdom. We cannot even say to what extent a body of law existed dealing with criminal offences, but we are better informed about civil law, for even as early as the reign of Sneferu of the Third Dynasty we find, in the inscription of Methen, a complicated series of bequests which testifies to the advanced condition in which the law of property must then have been.

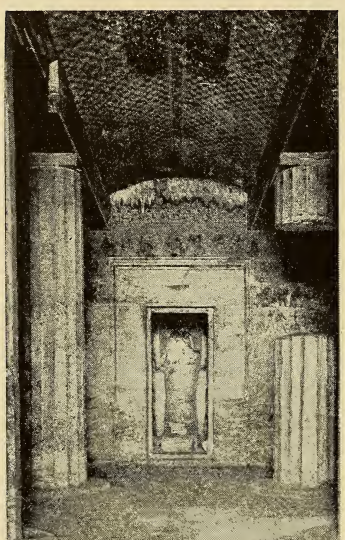
Under the Fifth Dynasty we have several tomb inscriptions recording bequests of land, mainly in consideration of funerary services to be performed by the legatee for the testator; and among the papyri found at Illahun, or El-Lahun, are a number of contracts, conveyances and wills drawn up in such stilted and conventional phraseology that they can only be the work of a body of professional lawyers.

Such testamentary enactments show that the law of property not only existed, but was respected in Egypt under the Middle Kingdom. It is hardly likely that criminal law was much less fully developed, and we may hazard the guess that the forty rolls of the law which were spread before the vizier in his court in the Eighteenth Dynasty already existed in some form in the Twelfth.

How far does this very advanced legal system reflect an ethical code, and how far had this latter, if it existed, a religious background? These are questions which are not easy to answer. The very incomplete picture which we possess of Egyptian religion under the Old and Middle Kingdoms represents it as a somewhat formal and impersonal affair. The sun god Ra, who came into full prominence at about the beginning of the Fifth Dynasty, and was combined with the falcon god Horus in the form "Ra-Horus-of-the-horizon," had suffered a further syncretization when the Thebans came to power, for he was then combined with Amen, the previously obscure god of Thebes, as Amen-Ra. He it was who now ruled the fortunes of Egypt.

To the ordinary Egyptian Amen-Ra was doubtless a very shadowy and distant figure, and the religious interest of the ordinary citizen, in so far as he had any, centered in the deity of his native town or district. Even here religion seems to

have been a matter of observance and ritual rather than of conscience, and the boastful autobiographies inscribed by the nobles in their tombs seldom or never refer to the doing of right for its own sake, or because the gods demand it.



ARISTOCRATIC IMPORTANCE EXPRESSED IN A TOMB

Before Senusret III asserted the supremacy of the royal government, the feudal nomarchs ('barons') acted as petty kings within their own nomes. Emblematic of their independence are the magnificent tombs that they had constructed in imitation of royalty; above we see the fane-like interior of that built by the nomarch Ameni at Beni Hasan. This ostentatious practice came to an abrupt end in Senusret III's reign.

Sir Flinders Petrie

The didactic papyri give the same impression, and where honesty is inculcated the reason given for practising it is generally merely that "it pays." At the same time, we can trace in the Middle Kingdom the beginnings of a moral standard and a belief in judgment in the hereafter. This is in part connected with the increasing popularity of Osiris, who, in the Middle Kingdom, is now domiciled at Abydos as god of the dead.

When we turn from the moral to the material side of Egyptian life an easier task confronts us. Here in some respects, though the general conditions of life remain the same as in the Old Kingdom, it is possible to chronicle an advance. There were two reasons for this: first, the development of foreign trade, and, secondly, the transference of the national labor from the useless task of building pyramids to the profitable one of improving the irrigation system of the country. The first of these reasons may more suitably be discussed a little later. Of the second a word is necessary here.

The Fayum oasis, which lay immediately west of Middle Egypt, formed a depression below sea level which was flooded each year by the Nile. The kings of the Twelfth Dynasty conceived the idea of controlling the inflow and outflow in such a way as to collect large quantities of water during the flood time and release them gradually, and as required, during the low Nile season. The idea was similar to that of the modern dam at Aswan. To which of the kings the conception or the execution of this project was due is not altogether certain, though tradition associated it with the name of Amenemhet III. The scheme included the reclaiming of a very large area of flooded land at the entrance to the Fayum by means of a vast wall.

The effects of these improved conditions soon became visible in the increased prosperity of the country. The position of the serfs was doubtless much the same as it had been under the Old Kingdom; indeed, it hardly changed throughout the whole of Egyptian history. The noble, however, led a life of luxury and enjoyment, combined in some cases with genuine care and thoughtfulness for those under his authority.

He gave bread to the hungry, clothes to the naked, he ferried across the Nile those who had no boat. In times of stress he ensured the corn supply of his district, and we will hope that his claim never to have robbed the widow or despoiled the orphan was something more than the pious iteration of a hackneyed tomb formula. He took his pleasure hunting on foot such game as still inhabited the

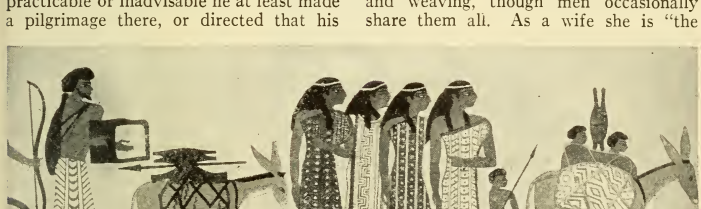
desert, or in his frail papyrus canoe on the marshes, spearing fish with the harpoon or bringing down wild duck with his throw-stick.

One of the main social features of the Middle Kingdom is the emergence of a numerous middle class. This development is to be attributed to improved conditions in general, and more particularly to the increase in foreign trade. The middle class is strongly represented among the tombs of Abydos, where every good Egyptian wished to be buried near the great god Osiris. Should this be impracticable or inadvisable he at least made a pilgrimage there, or directed that his mummy should be conveyed thither before being finally laid to rest in a tomb in or near his own town.

Foreign conquest brought about other changes in society. The foreign slave became an institution. He generally seems to have been a Syrian, though there must have been Nubians too, and the word for Syrian, *Aam,* becomes almost a synonym for slave at the time of the Twelfth Dynasty. Such slaves were not always attached to private individuals. More frequently we find them in the service of the temples, to which they were allotted as the gods' share of war booty. The temples, however, received not only slaves, but cattle, grain and treasure of every kind from these foreign expeditions. This led naturally to a great expansion in the numbers and wealth of the priesthood, and in this way were laid the foundations of a power which a thousand years later was to oust the Pharaohs from their throne.

The position of women in this society was by no means a low one. The house, however, was the woman's domain, and in paintings she is represented as of a light yellow color in contrast to the men who, as living mainly out of doors in the sun, are represented as being dark reddish brown. Hers are the indoor tasks such as baking, brewing, spinning and weaving, though men occasionally share them all. As a wife she is "the beloved" of her lord; she is shown in tomb scenes sitting with her arm round his neck, or accompanying him on his pleasure expeditions in the marshes, though on these occasions she is usually drawn on a smaller scale, perhaps only because she takes a less active part in the sport.

Nothing whatever do we know of the formalities which accompanied the celebration of a marriage. Normally a man had but one wife, but there are numerous cases of husbands who had two or more, and it is clear that the law did not forbid polygamy. The wise Ptahhotep says: "If you are a man of position set up a house [the common phrase for 'to marry'] and love thy wife in the house as is seemly. Fill her belly and clothe her



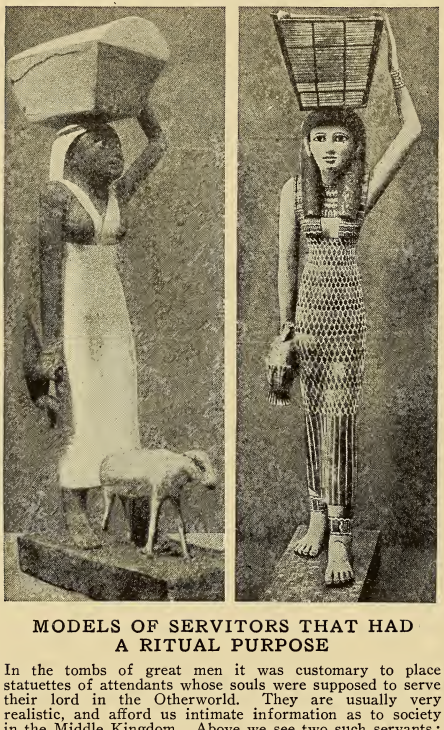
BEDUINS FROM THE DESERT BRING GIFTS FOR A NOBLEMAN

By the Twelfth Dynasty numbers of foreigners were coming into Egypt—many of them captives, brought as slaves. The majority of immigrants, free and unfree, were Syrians, as are the members of this party, depicted on the walls of a tomb at Beni Hasan. Led by their prince, or sheikh, who himself brings a gazelle, they prepare to lay their offerings of kohl before Khnumhotep, prince of Menat-Khufu and Administrator of the Eastern Desert, who held office during Senusret II's reign.

After Lepsius, 'Denkmäler'

back. Delight her heart so long as she lives."

Women played an important if subordinate part in priesthood. The musical side of the divine service in the worship not only of female but also of male deities was chiefly in their hands. Under the New Kingdom these musician-priestesses seem to have formed a harem of concubines of the god Amen-Ra, and the chief of them was known as the God's Wife. There is some reason to suppose that this priestess—concubinage had already existed earlier, under the Middle Kingdom.



MODELS OF SERVITORS THAT HAD A RITUAL PURPOSE

In the tombs of great men it was customary to place statuettes of attendants whose souls were supposed to serve their lord in the Otherworld. They are usually very realistic, and afford us intimate information as to society in the Middle Kingdom. Above we see two such servants: one (left) of negroid type, evidently an outdoor worker; and (right) a noble's hand-maiden from the tomb of Mehenkwetre.

Courtesy of Sir Flinders Petrie, Egypt Exploration Society and Metropolitan Museum, New York

The details of domestic life are well known to us, mainly from the paintings in the tombs. Of the ordinary house, however, little is known, for no houses of the Middle or Old Kingdom have survived except those of a small town specially built at Illahun for the workmen, engaged on the pyramid of Senusret II. Most of these are mere workmen's cottages, but the few larger houses belonging to the overseers differ surprisingly from the New Kingdom houses so well known to us from Tell el-Amarna. In both cases the material is the same, namely mud brick and wood. In both cases, too, the central feature of the building is a hall with a roof supported on columns, lit by windows high up in the walls above the level of the roofs of the surrounding rooms. But while at Tell el-Amarna this central hall has a loggia half open to the sky both to north and to west of it, at Illahun it is preceded by a broad room the whole width of the house, and this again by a colonnaded court.

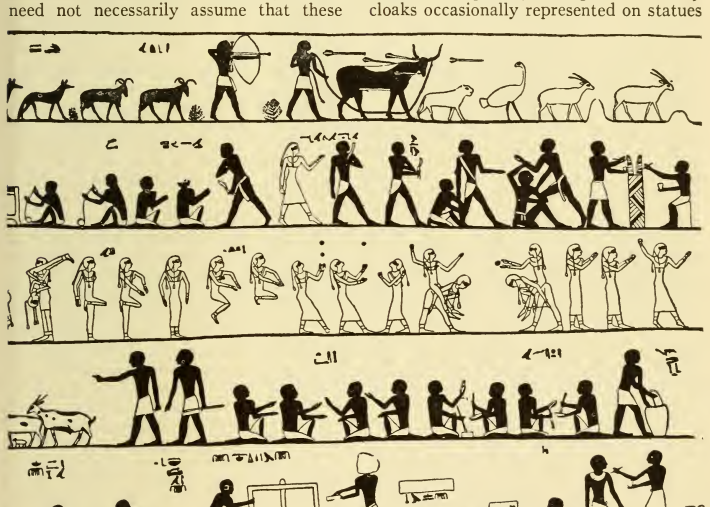
Let us try to picture the occupants of such a house. First there is the master. For ordinary occasions his costume will be a simple short kilt of fine linen reaching a little below the knees. At other times he may wear a longer skirt over this, reaching down to his ankles. In some cases this is to protect him against the cold and is of thicker material, but not always, for often it is of such fine linen that the shorter kilt is clearly seen through it. A rarer garment, worn perhaps only on festive occasions, though more commonly by the king, is the hunting kilt, a short skirt of pleated linen; both sides are rounded in front, and between them hangs a projecting trapezoidal apron of the same material as that of which the kilt is made. On the

master's feet—at any rate, if he be out of doors—are sandals either of plaited rushes or of leather.

Equally simply clothed is the mistress of the house, in a plain linen shift, reaching from below the breasts to the ankles and supported over the shoulders by two straps of the same material. For more festive occasions this may be supplemented by a garment of similar shape worn over it, and consisting merely of a network of beads.

Ordinarily, the master's hair was worn short or even close cropped, but on state occasions he would wear one of his wigs, of either straight or curly hair. His wife's hair hangs down in two plain tresses in front of her shoulders, but we need not necessarily assume that these are natural, for many representations show us ladies of rank as well as young girls and servants with quite short hair. The younger children of the house do not cumber themselves with clothing; the elder are clothed like their parents, boys in the short kilt, girls in the long shift. The former wear a long side-lock of hair, the latter a short tuft.

Nor is the household idle. In one room we shall find servants spinning flax with the simple spindle and whorl still used in backward countries all over the world; others are busy at the loom, weaving on horizontal or vertical frames linen cloth of varying fineness. Very little is known about the use of wool in the Old and Middle Kingdoms, though the heavy cloaks occasionally represented on statues



ACTIVITIES OF THE EGYPTIAN PLEBS GRAPHICALLY RECORDED

Considering the importance of art in the national life, it is only natural that artists at work should be depicted in Egyptian paintings. In these panels we see painters making sketches and decorating a statue. Humbler people, perhaps, are the craftsmen—goldsmiths and twine-makers. Scenes of hunting and merrymaking are included; girls are shown dancing and juggling, performing acrobatic feats and playing ball games, their attitudes suggesting light-hearted abandon.

From Newberry, 'Beni Hasan,' Egypt Exploration Society

or in paintings are clearly of this material.

In the kitchen, out of doors in the larger New Kingdom houses and perhaps already so in earlier days, the preparation of food is in full swing. Corn is being brayed in a stone mortar with a large wooden pestle in order to release the husk and break up the grains. Women then grind it into flour with a pebble on a large flat stone. Loaves of various shapes, made from spelt or barley, are being baked in cylindrical pottery or brick ovens, low and open in the Old Kingdom, tall and closed in later times.

YOUNG LADY OF ALLURE

Daughter of a great man, this girl, with her elegance and refined features, is representative of the womenfolk of her class. A closely fitting linen gown such as she wears was the normal feminine costume. Her hair is not necessarily natural since Egyptian women commonly wore wigs.

From Newberry and Fraser, 'El Bersheh,' Egypt Exploration Society

Brewers are taking lightly baked cakes of barley, spelt or *besha* grain, breaking them up in water, and forcing them, after fermentation, through fine sieves into large pots. Others are already bottling the liquor produced in tall two-handled jars.

Wine was probably made not in the kitchens, but near to the vineyards. Wine, the ancient Egyptian believed, was meant to make him glad, and feasting occupied an important place in his program. He would invite his neighbors to assist him "to make a happy day." We have representations of the guests, both male and female, sitting quietly watching the entertainment provided for their amusement, smelling at lotus flowers and drinking from the bowl as it is presented to them. An orchestra consisting of a small harp and a pair of flutes provides the basis of the music, while singers accompany it, marking the time by clapping their hands. Dancers, male or female, in normal Egyptian dress, though occasionally with an unusual tuft or tress of hair, perform what appear to be fairly simple movements of the arms, legs and body. It should here be noted that music and the dance were not only forms of amusement in Egypt, but were largely used in the service of the gods and the dead.

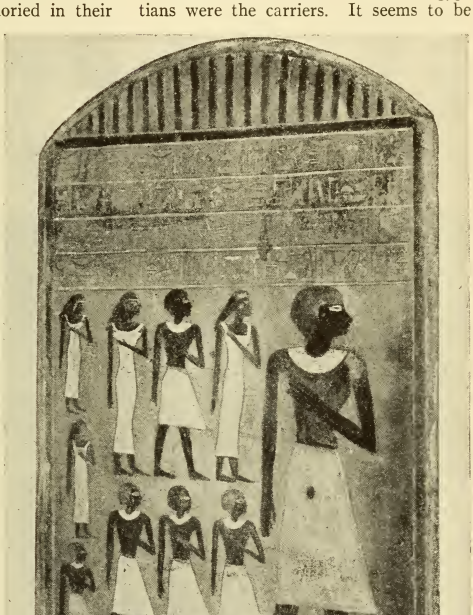
Of other physical recreations wrestling was the most interesting, judging by the pictures which have survived. The system was one of catch-as-catch-can. We have one picture of women playing at ball, and several in which we see them performing acrobatic feats, more especially the backward somersault. If less energetic forms of amusement were demanded, there were the various games played with pieces and a board.

We must now turn from internal and domestic affairs to glance at the relations of Egypt with her neighbors, for these had a very important bearing on her history and on her national character. The textbooks mostly tell us that the Egyptians were a peace-loving people, that in early times they had no standing armies, and that they rarely engaged in war before the New Kingdom. This is a totally incorrect view, and new discoveries show almost from year to year how very far from the truth it is. As a nation the Egyptians may have loved peace: most nations do. But their pe-

culiar geographical position made it impossible for them to enjoy it constantly. They accepted war as a necessity, and, even if they did not pursue it for its own sake, they at least gloried in their martial achievements. From the beginning to the end of Egyptian history the monuments chronicle war and its victories, and even in the reliefs on the temple walls the king victorious over his foes takes his place side by side with, or even to the exclusion of, scenes of divine worship.

It must not be thought, however, that Egypt's relations with her neighbors were wholly hostile. The discovery of Egyptian objects of the early dynasties in a temple at Byblus on the coast of Syria indicates not an Egyptian conquest of that town but ancient and friendly relations, of which the reference to Byblus in the Osiris tradition preserves a still more remote echo. Syria produced much that Egypt needed, and Egyptian kings of all periods imported from there the finer woods, especially cedar, with which they built their palaces and the temples of the gods. A dismal composition which purports to reflect the condition of Egypt during the Seventh to Tenth Dynasties, when access to Syria was cut off, pathetically asks what is to be done to obtain cedar and its oil for the coffins and embalming of the dead. This trade with Syria took place by sea rather than by the dreary and difficult land route, and one of the most ancient types of boat named in Egyptian inscriptions is the *kepenit* or "Byblus boat."

The Egyptians were expert sailors and boat builders, and when we find Cretan pottery of Middle Minoan type in the ruins of the Middle Kingdom town at Illahun we need not necessarily assume that the Cretans rather than the Egyptians were the carriers. It seems to be proved beyond all doubt that Egyptian stone vases of the Old Kingdom type had found their way to Crete, and there are not wanting those who would trace back the connection even farther than this.



COURTIERS IN SIMPLE GARB

The ordinary dress of a nobleman of the Middle Kingdom was a simple linen kilt, like that worn by Ameni, a warden of the palace, in this stele. Sometimes a skirt was worn in addition, and on ceremonial occasions a wig was conventional; the wide collar was an ornament rather than a garment.

British Museum

Not only on the Mediterranean but also on the Red Sea Egyptian maritime enterprise was early astir. The semi-tropical country of Punt, somewhere on the African coast near the south end of that sea, provided a substance essential to the Egyptians for the service of the gods, namely incense. From time to time expeditions were sent thither, and ships for the purpose were built on the Red Sea or Gulf of Suez.

A word may be added here as to the condition of the practical sciences of mathematics and medicine. The mathematical papyri which have come down to us consist almost solely of sets of examples worked out. The numerical notation went up to a million, units being represented by strokes up to 9, tens by from one to nine loops, hundreds by from one to nine spirals, and so on. In such a system multiplication by ten was simple, for it was only necessary to turn strokes into loops or loops into spirals and so on. The only other number by which direct multiplication was permitted was 2, and more complicated multipliers were dealt with in steps, 7 being, for instance, 2-times plus 4-times (got by doubling 2-times) plus one-time. Division was merely reversed multiplication.

Fractions were allowed, but only those with 1 as numerator (aliquot parts), such others as arose in the course of multiplication by 2 being at once split up into aliquot parts by a set of tables. The area of square and rectangle and probably triangle were correctly known: the area of a circle was found by squaring 8/9ths of its diameter, a very good approximation. The volume of the parallelepiped was rightly estimated, and, surprising to relate, so also was that of a truncated pyramid. Simple square roots and a formula for summing the geometrical progression also seem to have been known.

EGYPTIAN GIRLS AT PLAY

Games of ball were favourite pastimes among Egyptian girls. This scene in a Beni Hasan tomb seems rather to be in the nature of juggling, for the performers are carried pick-a-back, and have two balls in play at the same time.

Newberry, 'Beni Hasan,' Egypt Exploration Society

The medical and veterinary papyri are equally concrete and equally formal. They contain practically no statements of general principles, despite the fact that mummification must have given unrivaled opportunities for the study of human anatomy. As a rule each section gives a single case of sickness, with symptoms, diagnosis and treatment. The treatments consist either of taking medicines internally, generally in water or milk, often for four successive days, or in external applications. The materia medica of ancient Egypt contains a number of simple remedies used all the world over for the more common troubles.

However, their use was complicated by two curious considerations. The first was the superstitious belief that medicine could not be effective unless it contained some filthy ingredient such as the excreta of animals; and the second was magic. Almost every prescription was to be taken to the accompaniment of certain magic formulae. One, indeed, of the medical papyri which has survived lays much more stress on the formulae than on the drugs, for the proportions of these are not even stated. Thus, on medicine as on religion, magic laid its devastating touch. Medical science was already old in the Middle Kingdom, and yet it made

no advance from that time onward. Magic had stopped its growth.

What was the nature of this blight which had so baneful an influence on thought in Egypt? *Hike,* or magic, was the belief that forces external to oneself —for example, gods, the dead, other men, animals, Nature itself—could be controlled by the utterance of certain prescribed words or the performance of certain prescribed acts in the prescribed way at the correct moment. The dead were provided with a whole series of such magic spells written on their coffins, or later on a roll of papyrus, wherewith to meet triumphantly all the perils which beset even the good man in the next world and on his journey thither. Far back in remote ages *hike* had become a vested interest in Egypt, and no one ever had the courage to free any branch of thought or science from the paralysis which it caused.

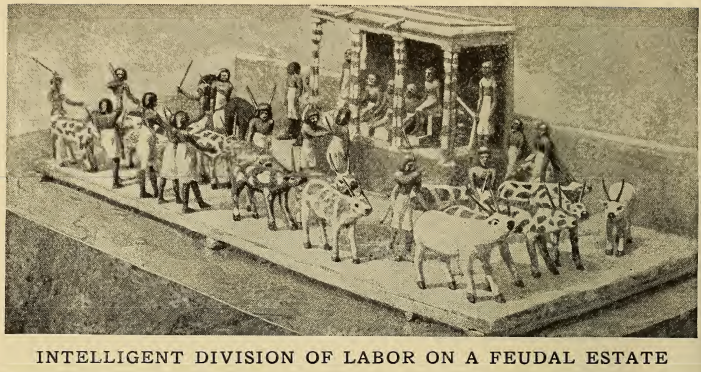
The history of the Egyptian art, like that of every aspect of the nation's development, consists of alternate light and dark patches. The Old Kingdom was perhaps the brightest patch of all, and in sculpture and painting the standard then reached was destined never to be surpassed and rarely equalled in later days. During the period intermediate between the Old and the Middle Kingdoms men's minds had been far too busy with other things to think of building tombs or palaces for themselves or temples for the gods. Consequently, the main incentive to art was lacking. The Heracleopolitans, however, of the Ninth and Tenth Dynasties were clearly enlightened monarchs who patronized the arts, and the all too scanty remains of their efforts show that the tradition of the Old Kingdom had not been lost.

Under the Twelfth Dynasty the artists of Egypt again found full scope for their powers. Strange to relate, we can say absolutely nothing of the architecture of that age, for not a single building remains to us save the brick pyramids of the kings and the scanty remains of the temples attached to them. The substitution of the brick pyramid for the vast stone structures of the Fourth Dynasty began

DANCERS WHOSE ART ADORNED A VIZIER'S FUNERAL

Music and dance were not only the normal relaxations at an Egyptian feast, but were employed largely in temple ritual. The four dancers in this wall painting from the tomb at Thebes of Antefoker, vizier to Senusret I, are probably votaresses of the goddess Hathor taking part in the funeral ceremony; notice the curious tress of hair, peculiar to dancers, and not unlike Chinese pigtails, worn by the pair on the left. The three elder women in the background are beating time to the dance with their hands.

From Davies, 'Tomb of Antefoker'



INTELLIGENT DIVISION OF LABOR ON A FEUDAL ESTATE

An Egyptian noble was evidently accustomed to count his own herds; here we see models of herdsmen, each about eight inches high, driving cattle before their lord, Mehenkwetre, who, surrounded by attentive scribes, is seated on a covered dais.

Courtesy of Metropolitan Museum, New York

with the Fifth, and is perhaps partly symptomatic of the diminution in the prestige and power of the king as against the nobles, but still more a sign of the return of common sense and the recognition of the fact that the employment of the whole labor of the land in such vast enterprises was uneconomic.

For the burial of noblemen the type of tomb hollowed in the face of the cliffs now tended to replace the mastaba with its underground burial chamber, and it is from such tombs at Beni Hasan, El-Bersheh and elsewhere that our main knowledge of the life of the period is drawn. Here relief sculpture has mainly given way to painting on the flat, and in this as well as in general finish and design these tombs are very inferior to the best work of the Old Kingdom. Their value for us is representational rather than artistic.

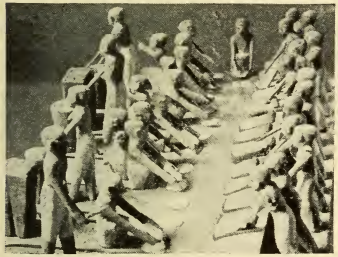
Sculpture in the round, however, now took a new lease of life. Unfortunately, the period is known to us almost entirely from a dozen or so of royal statues or busts, of various sizes and in various materials, and it is precisely in such royal pieces that conventionality is most to be expected. Yet all have very definite marks of the period, and not one could have been referred either to the Old Kingdom or to the New Empire. There is a massive strength about them. They are more "powerful," in the artistic sense of the term, than anything from the Old Kingdom, but they are less pleasing. They are not men of like passions with ourselves who really lived and died, like the Shiekh-el-Beled or the Louvre Scribe, but cold unearthly creatures who sit aloof—a breed of giants. And so we are unsympathetic towards them, and while we recognize the artistic merits in the colossal head, supposed to be of Senusret III, now at Cairo, and while we may see in the MacGregor obsidian head of Amenemhet III one of the world's greatest triumphs over an intractable material, yet we pass with a feeling of relief and pleasure either back to the real flesh and blood of the Old Kingdom or on to the gentle smiling ladies and amiable if insipid courtiers and kings of the New.

The achievements of the Egyptian people covered not only the field of arts and crafts, but also the realm of knowledge. It is as yet too early to affirm with conviction that they and they alone were the discoverers of writing; suffice it that as early as the First Dynasty they had already evolved a script capable of expressing their language. In origin it was purely pictographic; but, the limits of such a system being soon reached, pictures were devised that were purely pho-

netic in purpose. Thus there was acquired a set of signs each standing for a consonant.

Known to us as hieroglyphic, this system of writing was from early times used for inscriptions on stone, and those who know the tombs and temples of Egypt will agree as to its high decorative value, which the Egyptian artists did not fail to exploit. For everyday purposes, however, such a system was impracticable, and it was replaced by a script in which more rapid and sketchy forms of the signs were written in ink with a reed pen on leather or papyrus: this is known to us as hieratic. The papyrus reed was then a native of the Delta marshes, and several scenes in the tombs show us the papyrus harvest. The sheets of paper on which the Egyptians wrote were made by gumming together in a double layer strips of the fibrous interior of the stems.

By the end of the Twelfth Dynasty the Egyptians had attained a considerable height of achievement in literature. Little has survived from the Old Kingdom, and



SERVANTS WHO MINISTERED TO THEIR LORD'S COMFORT

Women also had their special tasks. Here, while some members of Mehenkwetre's household spin flax with simple distaffs, others weave linen cloth on the flat looms seen on the floor. Bread had its important place in Egyptian domestic economy. Above (*left*) are bakers kneading dough, which others place in ovens. (*Right*) apart from those who supplied his grosser, bodily needs—weavers, bakers, vintners and the like—Mehenkwetre also had servants who afforded him aesthetic gratification; he is seen in the deck-house of a model Nile vessel, attended by two minstrels.

Lower left, British Museum; remainder, Metropolitan Museum, New York

we cannot, therefore, assert with any confidence that here was the high-water mark of accomplishment. What is, however, certain is that a great contribution was made to literature and thought by the Heracleopolitans of the Ninth and Tenth Dynasties. From this period, or the years immediately following it, has survived a group of compositions which may be classed under the heading of pessimistic literature. They are the product of the depressing conditions of the period and the invasion of the Delta.

From them it is refreshing to turn to the literature of the full Middle Kingdom, but it may be doubted whether its literary value is as great. We have, for instance, the story of the Shipwrecked Sailor, which is nothing more or less than a fairy tale of the most naïve type. Then we have the story of Sinuhe, an Egyptian exile in Syria, a much more sophisticated production and, as such, less attractive. Next comes the Eloquent Peasant, in which a peasant who has been ill-treated by an official complains to a higher authority in such eloquent terms that his plaints are thought fit to be laid before the king for his entertainment. Let us hope that their overdrawn similies and exaggerated compliments were more to the taste of his majesty than they are to that of the modern reader. Far superior in literary value are the "Instructions" of Ptahhotep, a composition perhaps having its roots in the Fifth Dynasty when the vizier Ptahhotep flourished, and one of the earliest examples of that didactic literature which was to have such a vogue in Egypt, and which is so well illustrated in Hebrew by the Proverbs.

And what is to be said of the Egyptian mentality as revealed by these and similar writings? Modern judgement is that the reputation for wisdom enjoyed by the Egyptians in antiquity was almost wholly undeserved. They never had the philosophical temperament. Their religion was a mass of myth and legend: speculation as to the nature of existence, of life, of death or of morality was totally foreign to their nature. Conservative in the extreme, reluctant to consign anything, however valueless, to the mental scrap-heap, capable of holding at one and the same time two directly opposed beliefs without being conscious of any incongruity, they were doomed to stagnate. Mental progress was impossible to such a people.

Wherein, therefore, lay their greatness as a nation? It lay in their firm and resolute grasp of the concrete and the practical. This is clear in all their literature. The didactic papyri deal with rules of conduct. When they tell us how to behave at a neighbor's table it is mainly with a view to securing another invitation. Virtue is inculcated not as something having an abstract and eternal value in itself, but because "vice never brings its venture safe to port."

Similarly, in the scientific papyri there is no trace of the love of knowledge for its own sake. The mathematical papyri which have come down to us contain not generalizations and inductions, but hosts of examples in which three and seven are not abstract numbers but three loaves or seven oxen. In the same way the medical papyri betray practically no interest in the structure of the body or in the general nature of disease, but only in the method to be used in curing specific cases of illness.

From the modern point of view these are defects of culture. But who shall blame the Egyptians because they failed to produce Plato or Pythagoras? Let us rather admire them for that intensely practical genius, that adaptation of means to ends, and, above all, that high artistic sense which enabled them to make to ancient civilization perhaps the biggest contribution ever made by a single people.

BABYLONIA IN THE DAYS OF HAMMURABI

THE COMPLEX LIFE OF THE LAND OF THE TWO RIVERS AFTER THE FUSION OF SUMERIAN AND SEMITE

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THOUGH Nature cannot be said to have been generous in her primal gifts to Mesopotamia, there must have been some good reason for the Sumerians of the Turkistan steppes to have descended into the lower swamps of Babylonia. The lure which attracted these mountaineers may well have been the great fertility of the Irak valleys after cultivation, for in other respects it is a sterile land, where in prehistoric times Man was hard put to it to obtain even the stone wherewith to make his tools.

Pasture he would find for such animals as he might have, but apart from this his earliest assets would be the clay and reeds. On the clay he depended for his bricks, his pots, his reaping hooks and, after he had discovered how to write, his tablets, while the reeds gave him his reed huts, his baskets, his mats, even part of his food and, later on, his pens. The date-palm, as soon as he learnt how to cultivate it, was the great resource of the land, for it yielded him sweet fruit, treacle and arrack, and it could be cunningly made into furniture, roof-beams and foot-bridges over the canals.

Far behind it in value were the tamarisks, the willows, the acacias and the mulberries; but even these were too valuable to be used for fuel in a land where wood was scarce, and the housewife had a choice between the desert scrub, the bases of the palm branches or dried dung made into cakes wherewith to bake her daily stint of bread. But as a grain-producing country Mesopotamia was magnificent, and Nature showed that if only due labor were given she was no niggard in granting crops.

His principal crops were barley, wheat, sesame and millet; his fruit, dates, pomegranates, grapes, apricots, melons, figs, medlars, quinces, apples and probably limes; his vegetable garden brought forth abundantly.

Indeed, by the seventh century he could reckon on nearly three hundred different names for various species of plants and trees.

In addition to the clay and reeds, he was able to obtain from Hit the bitumen for caulking his boats, mortaring his bricks and making heads for his clubs. Sandstone and limestone were available from some localities, but most of the harder stones he had to find in the far north or in Arabia. His precious metals came from afar, copper being found in Persia, silver and lead in the Taurus, and gold partly in the north and partly in Egypt.

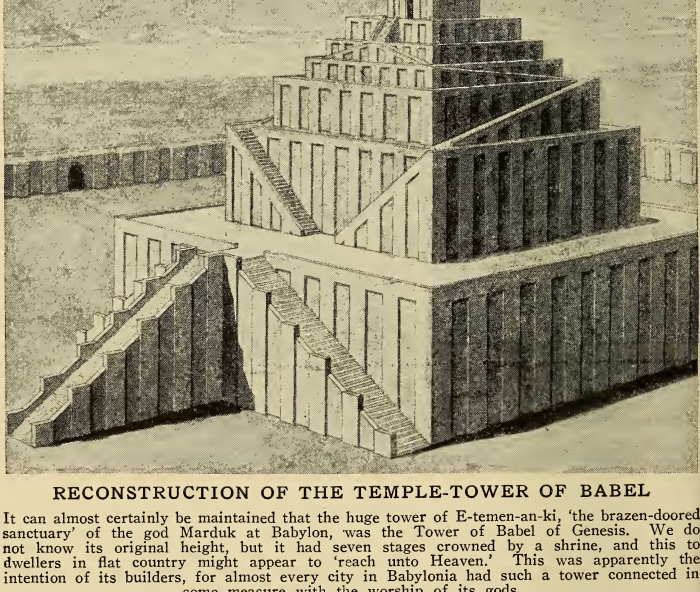
By the time of Hammurabi his flocks were of sheep and goats, his cattle buffaloes and oxen and his beast of burden the ass, doubtless a descendant of the wild ass that roamed the plains. The camel appears to have been confined to the Arab tribes of the desert, for we hear comparatively little of it, and there is still no definite evidence for the introduction of the horse much before this period. Gazelles, jackals, wolves, ostriches and bustards lived in the desert, and even the elephant to the far north-west; lions and wild boars inhabited the thickets near the rivers, and ibex the hills. Water-fowl, partridges, sand-grouse, bee-eaters, kingfishers, rollers, eagles, buzzards, hawks and numerous kinds of small birds were to be seen in plenty.

The stranger, travelling to one of the larger Babylonian cities, must needs go by boat up or down the rivers, or attach himself to some caravan of merchants, who for their better security had banded together. If he were fortunate he would

have an ass to ride; otherwise he must go on foot, following the laden beasts.

The first sight of his goal across the dull, unending levels would be the great pinnacle of the temple-tower of the city-god piercing the sky, a vast pyramid of adobe, faced with burnt brick, often divided into stages and even brilliantly colored, rising several score feet above the plain, with its corners set to the cardinal points. As he drew nearer, and the battlements of the walls became more distinct, he would leave behind the unowned, unproductive desert. Then the paths became better-defined, leading him through the cornfields; and so, through the orchards and date-palm groves, until he reached the outer fringe of the dwellings and reed huts of the poorer folk, who were content to huddle outside the city ramparts, unable to secure a foothold within the populous enclosure, but seeking such protection as the aegis of the city bastions could afford. Here the caravans would halt, ranging their packs in a circle about the beasts and drivers for whatever shelter they might get from their poor fardels.

Now would the traveller pass through the great city gates, ponderous structures of wood and copper, girt with high towers jutting from the walls and made to withstand all attack, even that of siege engines, all ready to be entrusted in time of war to the safe keeping of those city fathers, the judges. High and thick were the walls of sun-dried brick, and within their circuit lay the city, brown, flat-roofed, with streets sometimes paved with rough cobbles from the river bed, more often not paved at all and so becoming a slough of mud at the first rain-



RECONSTRUCTION OF THE TEMPLE-TOWER OF BABEL

It can almost certainly be maintained that the huge tower of E-temen-an-ki, 'the brazen-doored sanctuary' of the god Marduk at Babylon, was the Tower of Babel of Genesis. We do not know its original height, but it had seven stages crowned by a shrine, and this to dwellers in flat country might appear to 'reach unto Heaven.' This was apparently the intention of its builders, for almost every city in Babylonia had such a tower connected in some measure with the worship of its gods.

Modified from Koldewey

fall, compelling housewives to go abroad in sabots or mounted on pattens.

High above the cramped alleys loomed the central mound, the citadel, whereon lay the king's palace, the temple and its tower. Palaces and temples were solidly built of brick, both burnt and unburnt. The great desire of every man who had wealth enough was to build his house with a view to coolness in summer, warmth in winter, privacy from neighbors and protection from thieves; and so king and nobles planned their houses on the principle of one or more central courtyards surrounded by chambers, with windows (doubtless shuttered with wood) looking thereon. So, as the sun began to set, the walls would cast long shadows across the brick paving of the courtyard, and then could the master of the house have the couches strewn in the shade, where the evening breeze made the little trees of the court shake their delicate leaves.

In the hottest weather his bed would be brought out on to the roof, which, as in all countries where the rainfall is slight, was flat, made of beaten clay on palm-trunks or poplars, surrounded by a parapet and drained by great projecting waterspouts. There was little fear of thieves, even in the ordinary houses of the well-to-do, for the one door which gave on to the street was of stout wood, and close behind it slept the porter.

We get a rare picture now and then, thanks to the skill of the Babylonian sculptors, of what the king and his nobles or ladies looked like. As befitted a good Semite, the king would let his hair grow to his shoulders, and keep his beard, although removing his mustache. He wore a woolen mantle which enveloped his left arm, leaving the right arm free, and descended to his ankles; and doubtless his nobles imitated him, or, like the commoner folk, wore theirs shorter. Men left their heads bare, or else wore a turban of some kind. The mistress of a house attired herself in a long robe crossed over her bosom, or a kind of vest worn against the body under a cloak rather like the modern *abba,* while her slave girls perhaps went naked to the waist and with nothing but a skirt.

As time went on, and the Kassites took possession of the country, men adopted a long tunic with sleeves reaching to the elbow, and a high feathered head-dress, but the women still retained the long robe to their ankles. Under Hammurabi the people went barefoot, rarely wearing sandals; but presently, when the Kassites broke loose from their mountains and swept down on Babylonia, they introduced

ONE OF THE CITY MOUNDS OF BABYLONIA

Projecting from the mound that half entombs it, this shattered pillar of brickwork, accidentally vitrified by fire, is all that remains of just such a temple-tower as is reconstructed in the opposite page. It is known locally as the Tower of Babel, but the identification is wholly imaginative; actually a fragment of E-Zida, the temple of Nabu, it marks the site of ancient Borsippa, a town that lay a few miles to the south-west of Babylon.

Photo, Royal Air Force Official, Crown Copyright

foot-coverings very much like the soft string *espadrilles* worn today by the Kurdish hillmen.

All those who took proper pride in their bodies washed themselves with a soap made of vegetable lye and castor-oil, or rubbed themselves with oil, for it was a country prolific of bodily parasites,

and it was not for nothing that the apothecaries recorded in their herbals the proper plant-drugs to use as prophylactics.

If you dined with a man of good family in Babylon in 2000 B.C., you and your host sat on stools at a small table to which

HAMMURABI OF BABYLON

The typical costume of the age of Hammurabi consisted of ample garments of heavy woolen material. Here we see the great lawgiver himself, wearing the characteristic long tunic, flounced but tight-fitting, and in this instance with a series of little capes on the shoulders.

The Louvre; photo, Giraudon

slaves brought the feast. If the master of the house had no guests, his wife dined with him, but if there were other men present who were not of the family she probably retired to the women's apartments.

Made in thin flat pancakes, bread was piled high on a platter or circular basket-tray; it is possible that sometimes it was baked with the pernicious darnel to make it more palatable. Like the moderns, the Babylonians probably ate little meat, but there is no doubt that, apart from the priests who would share the good things of the god's table, the ordinary folk were able to obtain it at times.

They ate birds, especially geese, and fish, from both the sea and the river, and there was no taboo on either tortoises or shellfish. There was also, apparently, a kind of sweetmeat made of alum, corn and roses, which is defined as a *"bonne bouche* of the confectioner." Vegetables and fruit were plentiful, and the poorer folk ate the roots of reeds named *kungu.* Wine and different kinds of beer were drunk unsparingly; the water of the river was first filtered through a large porous jar standing in a wooden frame in a corner and then put into smaller vessels, also porous, and cooled either by being fanned with a fan made of straw on a handle, shaped like a flag, or by being left out on the roof parapet all night.

In addition to table and chairs the house would have its wooden boxes, its beds and even a wicker bird-cage, containing some unfortunate corpulent sand-grouse. A niche in the wall served as cupboard; then there were the unglazed clay pots and copper implements and pots, and corn rubbers of flat stone slabs, and some form of charcoal-brazier to ward off the cold of winter.

Now, consider the outlook of such a noble about 2000 B.C. First, his political views were limited to a small compass, owing to the narrowness of his world, a narrowness due to the lack of means of traveling either far across difficult country, or fast to escape from his foes by the wayside. All this was shortly to be changed, but as yet the factor which was to bring it about—the horse—had barely been introduced into the country, and consequently little was known of distant lands.

Secondly, there was his outlook towards his own people. He, as a town-dweller, looked with no little contempt on the nomads of the desert, and here he was convinced of his superiority, just as the Arab of all times has believed the converse. Even in an early edition of the great Babylonian epic which tells the story of Gilgamesh, the writer at this

very period has introduced the theme.

Gilgamesh is the tyrant king of Erech, and this theme of the great difference between the town and the country runs through the first part of the epic, in the stanzas which lead up to the tremendous combat between the king and a wild creature of the desert called Enkidu. Enkidu is a rough, uncouth fellow, created from a clod by the goddess Aruru, who spends all his life in the wilds until such time as his mate, the singing-girl with whom he has fallen in love, entices him into the city of Erech that he may fight Gilgamesh.

Here, as the incident is told, there appears, on the one hand, the little gibe of contemptuous civilization at the bucolic simplicity of the savage; to quote the exact words of 2000 B.C.:

> The bread which she had set before him he broke, gazing, aye, staring: Enkidu knew not how to eat bread, to drink mead he had not been taught.

In good sooth, as the text says, "he had been wont to *suck* the milk of the animals." Then, when the girl tells him that bread and mead are the proper concomitants of civilized life, he gorges himself and drinks his fill of seven bumpers of mead, which have the effect of "freeing his spirit," and, finally, when he dons civilized garb, "he becomes like a man of good estate."

This, however, was merely the natural feeling between townsfolk and provincials. There was a far more serious division of the people into castes, recognized by law, and due perhaps to the gradual upheaval caused by the decadence of the Sumerians. The man of the upper class was called *amelu*, a title which comes to signify merely "man." Another class of men was called *mushkinu*, a word which reappears to this day in Arabic, usually meaning a poor man, and to this day it is to be seen in the French *mesquin*. In Hammurabi's time the *mushkinu* appears to have been a client or dependant of the temple. The plebeians were, it is believed, called *mâr ummânim*, and the last class were the slaves.

KING BEFORE HAMMURABI

Before Hammurabi's conquests, Babylon had no preeminence among Mesopotamian states; one of its early kings (anonymous, c. 2200 B.C.) is seen above.
British Museum

It does not appear that slaves were a hardly used class in Babylonia. Slavery was an institution which went back for certain almost a thousand years before the time of which we speak, but the ordinary noble does not seem to have possessed an undue number of them. Moreover, the relations between such a noble and his slaves were so intimate that he could both discuss his most confidential affairs with a chosen manservant, and be prepared to add a slave girl to his harem.

Actually, a slave, although he was his master's personal property and was so marked on his body, either by branding or tattooing, had certain rights. He (as much, probably, as the artisans) was liable to be called out, it is true, for the *corvée;* he might be sold or pledged like a debtor's wife, son or daughter, for debt, and his property belonged to his owner. Also if he ran away it was a crime to give him sanctuary, and a fixed reward was paid for his recapture. Still, if he married a free woman, she would remain a lady and his children would be free, and, moreover, both he and his wife could acquire property, the half of which his wife and children would inherit. If such a *seigneur* as we are discussing took a slave girl into his harem, and she bore him children, both she and they would be free after his death.

Life for one of the upper-class nobles about this time was easy, particularly if he were one of the secular officials and had nothing to do with the church. Hammurabi had left his mark on the land both as a lawgiver and as an anti-ecclesiastic. On the one hand, he had re-edited the old laws, and had set up his version on a wonderful pillar of diorite, known as the Code of Hammurabi, which was in subsequent years to be carried off as a trophy to Susa, over the Persian border, in some campaign. On the other, it seems to have been due to his influence that the old Sumerian *patesi,* or *ishakku,* the prince-priest, once so powerful, was reduced to the lower grades of officialdom, showing thereby Hammurabi's determination to be king, and to brook no manner of interference from the priests.

HOW ASSYRIAN NOBLES DRESSED

From the nobility the state departments and learned professions were recruited. This noble of Ashur is of Hammurabi's period.

From Andrae, 'Kunst des Alten Orients'

He, the unifier of Babylonia, was a king in good sooth, the supreme head of the land, and it is in his time that we see a rapid decadence of the power of ecclesiastics in the law-courts, for where in the past the priests had had the right of judicial decision, the judges were now secular. Obsessed with his own pride as a lawgiver, he had evidently deposed the priests in order that he himself might exercise to the full the power of adjudicating in the final appeal, and the numerous letters extant from him to officials in this strain show how deep his interest was. Our noble, for instance, if he had been one of the numerous local governors such as were appointed to outlying towns, a mayor with the title of *rabianu,* and with full power in his own civic court as chief judge, would have had to reckon with perpetual interference from the Throne, albeit there appear to have been one or more courts above him in which a case would be tried before the final appeal to the king.

Yet there can be very little doubt, in spite of the irksomeness of the continual reminders of royal authority, that the country under Hammurabi must have been very well governed.

The law gave great power to the administering judges, and the penalties laid down seem to us to have been very severe, rape and certain cases of robbery, incest or adultery being punishable by death, while sixty blows were given for striking a superior; the principle of the *lex talionis* was in force, and payments of money were frequently imposed. It was exactly in keeping with the king's character to include in his code the proper fees and wages for the different professions and trades.

In just the same way, the king was head of the army. If our noble had been one of those officials entrusted with the duty of finding soldiers, known as a *rid sabi,* he was at the king's command, and might have to be absent from his family on service for long periods. If he shirked it, and tried to send a substitute, he was liable to be put to death.

As for the police or gendarmerie, they appear to have been under the orders of local commanders, the central government having a right of indicating their employment in case of need. This is inferred from a letter which orders the recipient to post a gendarme to make certain that a due amount of grain is handed over to its owner.

Turning now to the family life of such a noble as we have been discussing, we can speak with fair confidence of the matrimonial customs in vogue. Youths and maidens fell in love, as at all times and in all lands, and the young man would seek aid from magic, if we may infer anything from a cuneiform love-charm extant, which certainly points to the young man's fancy straying towards some particular, though coy, damsel. But actually we do not know how much it was customary for the young people to see each other before the match was

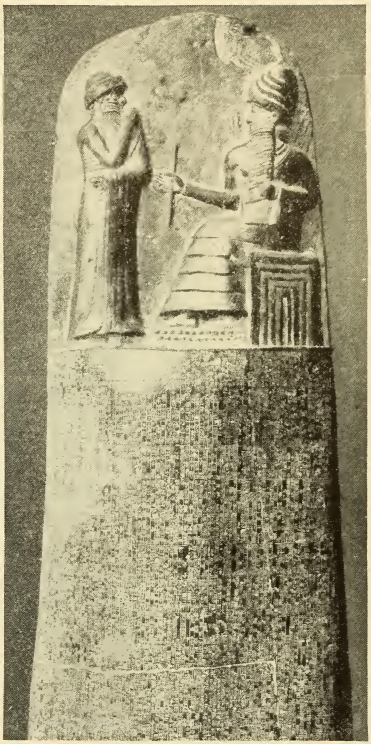
arranged, or whether the middling-gossips arranged it all; and yet there is no little hint of moonlight courtship in the song a lover sings to his lass, "Love is a lamp to lighten an eclipse," or the lovelorn damsel's song, "After I have lain in the bosom of my dear." Unless Babylonia was very different from the rest of the world, Ruth and Rachel had their counterparts among the maids of Babylon, and Thisbe's story is a true picture of what might have happened amid the yellow brick bastions.

Whatever the preliminaries, however, the first official step of our Pyramus was to bring his prospective father-in-law a present, a relic of days long gone when men bought their brides. Then came the formal contract before witnesses, for the law lays down that the bride without her marriage lines is no wife; doubtless the bridegroom followed the custom of which we are told in the later laws, and plighted his troth in the presence of his friends, taking his bride with the words, "She is my wife." No oriental wedding was ever complete without music and feasting, and the staccato cacophonies of harp, drum and pipe pursued the crowd of merry-makers.

It was the part of the bride's father to give his daughter a dowry, and woe betide him if he forgot. We hear of a lady receiving a slave girl, two shekels' weight of gold for ornaments, headbands, clothes, a corn-grinder, copper implements, chairs, even a parasol, and besides all this a well-furnished house and garden—an unusual addition, for it was customary for Pyramus to lead Thisbe back to his father's house.

If by any chance after the preliminaries had been settled the lady's father changed his mind about giving the suitor his daughter, he was mulcted in twice the value of the present the young man had brought; if it was Pyramus who jilted his lady-love, then he must needs leave the present in her father's hands.

Thisbe's position as a wife was secure in her own house, although the Babylonian proverb makes it clear that "grey mares" were not popular: "A house without a master is like a woman without a husband." Only if she turned out to be perpetually ailing might her husband take a second wife with full rights; otherwise he might marry a secondary wife, and might add a slave girl or two to his harem, but none, in fact, would be likely to oust Thisbe from her position. Even if she had had a sister who was also taken by her husband in marriage, the two ladies would not be on the same



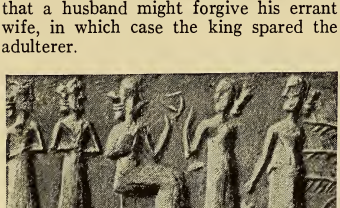
HAMMURABI'S CODE OF LAWS

Engraved on a stele piously decorated with a representation of the king receiving the laws from Shamash, the sun god, Hammurabi's Code throws the clearest light on Babylonian society. In 182 paragraphs it summarizes existing laws.

The Louvre

level; it would have been stated in the marriage contract that one was definitely inferior, and to mark this she would have to wash her sister's feet, and carry her stool to the temple.

But there was the old, unfair treatment of woman as against man in the law, should either weary of the other. Divorce was easy for Pyramus, difficult for Thisbe; for he could divorce her for no fault of her own, by merely returning her the dowry which she had brought with her, or, if she had brought nothing, by sending her away with a gift of money. If she turned out to be a featherbrain without care or thought for her household, she risked losing even this dowry when her impatient spouse turned her out. If, on the other hand, he ill-treated her, it was considered good reason for her return to her father's house. Adultery on the part of the husband with another man's wife was not only rebuked in the moral texts as a grievous sin, but rendered both the offenders liable to death by drowning, with this proviso, that a husband might forgive his errant wife, in which case the king spared the adulterer.



DEDICATED TO A GODDESS

Among the most honorable careers open to Babylonian women was the service of religion, and many seem to have entered upon it. Here we see perhaps four priestesses of a goddess, two standing before and two behind her.

From De Sarzec, Découvertes en Chaldée

Here it is fitting to turn aside for a moment and discuss the position of women in general at this period, and, in particular, contrast their lot with that of women in Egypt.

Speaking broadly, we may say that the men of both nations respected and loved their women, but if comparison be possible we must award a slight superiority to the Egyptian. There is a soupçon of approximation to the early nineteenth-century epithet, "females," in Babylonian ideas which is not so perceptible in Egypt. This, however, appears to be the nearest they would go towards the modern Arab's contempt for women.

Consider, first, the filial piety of the two. Here is an Egyptian's exhortation to his son to treat his mother kindly:

Multiply the loaves which thou givest to thy mother, and carry her as she carried thee. When thou wast a heavy load she carried thee often. . . . When she brought thee forth after thy months [were fulfilled] she set thee like a veritable yoke on her neck, and her breasts were in thy mouth for three years. . . . When thou art a young man, and dost marry a wife, and art the master and possessor of a house, I pray thee to consider thine own childhood, and how thou wast reared, and to do for the child that shall be born to thee everything that thy mother did for thee.

The Babylonians seem perhaps to have been less demonstrative. Gilgamesh can go to his mother for help to interpret his dreams, but it has to be admitted that his conversation with her is merely courteous; and it would appear from contract tablets that a woman would anticipate her death by handing over her property to a daughter in return for maintenance during the rest of her life, a custom which compels us regretfully to recognize the Babylonian business element even in filial piety. There is, however, no question about the love of a Babylonian mother for her son, or the duty of a son to his mother.

We find the same nuance of Egyptian superiority in the relation between husbands and wives. The love of an Egyptian husband for his wife appears to have been great, as can be inferred from the number of times both are represented together on the same group of statuary. The wife accompanies her husband on his holiday trips, and even kings have no shyness about their sculptors or painters recording their little marital tendernesses to each other, while the love-songs which have come down to us breathe all the passion of a later period in Europe.

Less feeling is shown in the parallels from Babylon. The sculptures rarely

include conjugal scenes, but a later Assyrian relief shows the queen of Ashurbanipal feasting with her lord; yet the whole picture is one of restraint, and there is nothing like the camaraderie obvious in the charming and touching Egyptian groups.

If there really be this difference between the two lands in their appreciation of women, we shall not be far wrong in seeing its genesis in the marriage customs. In Egypt a brother might (and often did) marry his sister, while such a relationship would have been impossible in Babylonia. This would indicate a difference in the upbringing of the sexes; in Babylonia it would appear that the sons and daughters were separated at a fairly early age, the son to follow his father, the daughter her mother.

Yet we cannot in all fairness afford to stress overmuch this difference, which, after all, appears to be only a difference in the ideas of demonstrativeness. The ordinary letters of everyday life between men and women would give the lie to any slander that the Babylonians were not as fond of their wives as other folk.

The expected advent of a child to the newly-wedded pair was hailed with delight, and there is a letter extant, later by many hundred years, it is true, than this period, but none the less representing the thoughts of every Semite. It comes from the expectant father to his wife: "An abomination to the gods (in sooth)! Why have I had no news from thee? My heart rejoiceth that thou art to become a mother."

After a child was born he had no rights, and when he grew up the father could pledge him for debt like a slave; time had been when he could disinherit him arbitrarily, but this had been done away with by Hammurabi, who made a legal process and the adducement of a good reason for such a stern course compulsory.

With the payment of a dowry, a daughter might be dedicated by her father to a temple to be a priestess, and this seems to have been one of the highest professions for women. It is true that women might carry on various trades, even that of a scribe, and might conduct business transactions or act as witnesses to documents, so great were their privileges and liberties; but when we find Nabonidus, the last king of Babylon in the sixth century, dedicating his daughter as a priestess of the Moon

PASTIMES BELOVED OF CHILDREN

That certain toys were very early evolved is proved by this lively relief at Carchemish. We see two youthful members of the royal family engaged in a game of knucklebones, while others are whipping spinning tops; these must also have been known to the children of Babylonia.

Photo, Sir Leonard Woolley

in Ur of the Chaldees, it is clear that a priestess must have ranked very high in the social scale.

The most important priestess was called the "Bride of the God," and after her came several priestesses who appear to have been secondary wives of the god. They lived in a charming little convent in the temple, and so careful had they to be of their reputations that they incurred the penalty of being burnt alive if they even entered a wine tavern. Although it is uncertain whether the "Bride of the God" married a human husband also, there is no doubt that the secondary wives did; but, curiously enough, they did not bear their husband children.

To these two classes must be added a lower one, that of the temple prostitutes, particularly in the train of the goddess Ishtar at Erech. To one class of these

it was customary for Babylonian ladies, and even women of the poorer class, to put out their babies to nurse.

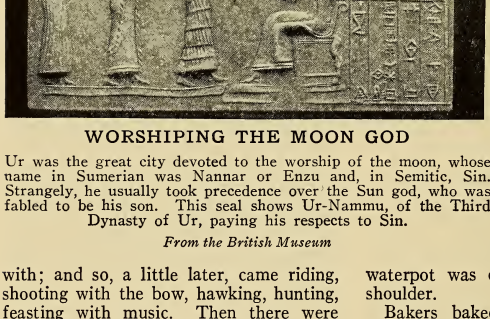
On the father's death the widow and the children inherited his property, the sons taking equal shares, and the widow, besides her share, taking back an amount equal to her marriage portion; daughters who had had dowries were excluded, but if they should not yet have received anything it was for the brother to give a marriage portion.

So much for the more serious side, the responsibilities, of a man's life. What were his amusements?

As a baby, he began with a clay rattle. Then, when he had grown a little he had tops to whip and knuckle-bones to play with; and so, a little later, came riding, shooting with the bow, hawking, hunting, feasting with music. Then there were the religious festivals, especially the Feast of the New Year; and we might not be far wrong in thinking that something resembling plays were acted, like the Song of Solomon, perhaps even the Gilgamesh Epic. There appears to have been, even in early times, a common meeting house in the community for men, just as an Arab village in southern Mesopotamia will have a large reed hut set apart in which the men are to be found drinking coffee and eternally reiterating the futilities of illiterate village conversation.

The man had always the means, at least as early as the seventh century, of artificially banishing sorrow by taking *binj*, or hemp, although there is nothing to show that such a vice was common; and if he drowned his sorrows in wine, for which there were ample opportunities and a bad example from the gods, the physicians were ready with a selection from their thousand-and-one remedies to relieve the subsequent results.

It was the bazaar, however, that held all the life and movement of the city. Hither came the merchants with their caravans from far countries, bringing the gossip of a hundred strange cities; here would you find scribes ready to draw up a deed for every form of contract necessary. Few trades were unrepresented in the bazaars. Apart from the hucksters in their booths selling the products of others, there were the guilds of craftsmen. Coppersmiths made pots and pans with the same clangor as they do in Baghdad today, and they, like the goldsmiths, were banded in a guild under a master-craftsman. Tailors used flax and wool, the women spinning the thread on spindles. Potters, even in Sumerian times, were able to turn cups in a very delicate thin ware on the wheel, and their favorite shape for a waterpot was one with a spout at the shoulder.



WORSHIPING THE MOON GOD

Ur was the great city devoted to the worship of the moon, whose name in Sumerian was Nannar or Enzu and, in Semitic, Sin. Strangely, he usually took precedence over the Sun god, who was fabled to be his son. This seal shows Ur-Nammu, of the Third Dynasty of Ur, paying his respects to Sin.

From the British Museum

Bakers baked with flour which had been rubbed by hand between two stones, adding their leaven from the previous day's batch. The loaves were either in a flat pancake shape, and were baked by being tossed through an opening in the shoulder of the dome-shaped ovens to adhere for a minute to the heated wall inside, or else they were cooked in the ashes, Arab-fashion, and, therefore, called "ash-bread." Butchers must have killed many animals to provide the skins necessary for water-bottles, and rafts, and the leather for shoes, drums and military equipment; but meat would be a luxury, and not much eaten by the

poorer folk. The tanners worked up the hides into leather with gall-nuts from the dwarf-oaks of the hills, which to this day retain their ancient name *belût,* and with sumach, an essential in their trade for coloring the leather.

Carpenters and shipwrights, though hampered by lack of wood, could build massive gates and ships capable of carrying ninety men; stone-masons were equally limited by want of material, and yet they were good sculptors. Experts could glaze beads with a frit of sand and alkali made of the sodaplant, *Salsola kali,* growing near the sea. Dyers apparently used woad for their blues, saffron and tumeric for their yellows and probably safflower for red. All these treasures were to be bought, not for coins, since coined money was not yet, but for silver given by weight, the units being the *mana,* about 18 oz., and the shekel, a sixtieth of the mana.

This much for the material side of life in Babylonia; it remains for us to consider the spiritual conceptions.

Religious belief was certainly genuine in Babylonia, and no one appears to have doubted the existence of the gods, although equally no one would deny that some gods were more powerful than others, and that limitations of locality would affect their capacity to help men. Religious observance, too, was not only a state institution, in which the king and the priests and their numerous following played an important part, especially at the great festival of the New Year; it was very definitely individual and personal, and remained a factor for conservatism down to the very end.

In the beginning, when each tribe worships its own local god with all the attributes of a tyrannic human being, there are as many deities as there are tribes. Then, as a gradual centralization of the tribes takes place under one head, the natural tendency is to recognize one of the gods as particularly prominent above all the others, who either take a subordinate position or drop out of remembrance altogether.

Such was the case at Babylon. Hitherto, under the Sumerians, each city-state had had its own tutelary deity, but, with the welding together of the Babylonian kingdom, Marduk, the chief god of Babylon, rose to high popularity, just as subsequently Ashur was to take preeminence in Assyria. This, however, did not prevent the continuance of the worship of other gods, although their prestige had suffered a partial eclipse; the Sun god (Shamash) would always retain his

ISHTAR THE MOTHER GODDESS

Ishtar, queen of heaven, promoter of love and fertility, set the type for the mother goddess all over the nearer East. In the great Carchemish wall-relief (right) she stands winged and offering her breasts. Similar figurines of her are found on every ancient site; the two on the left are from Ur.

Carchemish statue, Sir Leonard Woolley

worshippers at Sippar, the Moon god (Sin) at Ur, Nabu at Borsippa.

Nay, not only would the inhabitants of any large city worship their own city god, but also, recognizing the right of other gods to exist, would frequently welcome the building of small shrines to them in their midst. It is this local variation in renown which makes it impossible to ascribe the entire hegemony over the Babylonian Olympus to any one god.

GOD OF STORM

Adad, a weather god of the western Semites, became popular during the First Babylonian Dynasty; note the forked lightning which he carries.

The Babylonian Semite owed much of his religion to his Sumerian predecessors, and through him many gods and goddesses who were worshipped by the Sumerians were introduced to other Semites, and incorporated in their several religions, ultimately reaching Egypt, Asia Minor, Greece, Rome and even Britain. Two great triads of gods stand out prominently: first, An (Anu), Enlil and Enki, and, secondly, Sin, Shamash and Ishtar.

Anu is god of the sky, known as the "King of the Gods." By the Semites of Hammurabi's time his wife was known as Antu, merely a feminine counterpart of himself. The home of both Anu and his daughter Ishtar was the city of Erech, where they dwelt in a temple of high antiquity. The second of the triad, Enlil, was called Bel by the Semites; he was probably originally a lord of the air or wind. He was called the "Great Mountain," which points to a connexion with the winds or upper air, doubtless on account of the cloud-capped peaks and slopes. His chief wife was Nin-lil, the "Great Mother." Enki (or Ea, as the Assyrians called him) appears originally to have been lord of the Earth, but in the sense of the ground out of which the hidden waters flow. He is particularly the god of the great waters, the sea swamps and tidal lagoons of the south, where lay his capital, Eridu, one of the earliest Babylonian cities. His father was Anu; and his son, Marduk, was to eclipse the glory of Enlil during the rise of the First Dynasty of Babylon.

Now, while the cult of Anu survived locally in Babylonia down probably to the end of the use of cuneiform on the temples (i.e. the first century B.C.) and then died, Enlil, or Bel, had many points beside his name in common with the local Baals already worshipped in Syria, and was adopted into the later and more western cults.

The second triad of gods is bound up in close relationship to the first. Enzu (Sin in Semitic), the Moon, is the first-born of Enlil, according to very early inscriptions. He is the father of Utu (Shamash), the Sun, who usually takes a secondary place to the Moon; even in the astrological texts the omens always give Sin the precedence: "When the Moon and the Sun——"

Ishtar, the equivalent of the Sumerian Ninni or Innini, and the star Venus, is the most important goddess in Babylonia, and is regarded as the daughter sometimes of Sin, sometimes of Anu. She combined the functions of mother goddess, goddess of love and goddess of war, and, as the star Venus, was worshipped under the name of Dilbat.

Her abode was with her father Anu in Erech, where, as goddess of love, she was attended by troops of singing and dancing girls, who by the duty of their worship took part in the licentious rites of her cult. In one of her forms, that of mother goddess, she is universal throughout the Near East, from the almost life-size sculpture of her at Carchemish offering her breasts, to the little clay figures, so often to be picked up on Babylonian sites, which are probably votive offerings from women who desired children.

She is the wife of Tammuz, the beautiful youth Adonis (which is merely a Semitic word, "lord"), who, according to a legend, was killed by a wild boar. Bereft thus of her husband by death, she followed him to the Underworld, to res-

cue him from the clutches of the grim goddess Ereshkigal, and with her departure from the earth all its reproductivity ceased and the vegetation died. Each year was this repeated, typifying the winter and the return of spring as the lovers returned to earth, amid the rejoicings of their worshippers.

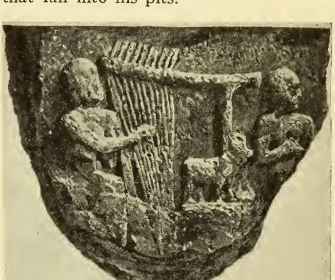
Of other gods, Mer (Adad), the god of the weather, was the son of Anu; he was worshipped throughout the Near East with little variation, and as a rule portrayed with three-forked thunderbolt. Nabu, the son of Marduk, was god of the art of writing. Nergal is ruler of the Underworld, a son of Enlil and husband of Ereshkigal, whose name has survived in a Greek charm.

Each city, as has been said, had its special god and temple, and one of the king's chief duties was to see that temples were built, dedicated and duly repaired and maintained for the benefit of the city-god. The rewards for which both king and commoner looked as a return for their piety were material benefits and, in particular, long life in this world. None sought for an amelioration of their condition after death by their lavish duty towards the gods while they were on earth, however much they might hope for pious offerings from their descendants, to keep them in decent comfort. Prayer and sacrifice were, in fact, merely safeguards for this temporal life. The king hoped by his devotion to the temple of his god that he would be granted long life; even the common people recognized that negligence in solicitude for the gods might result in misfortune.

Such piety, always with the hope of being blessed with temporal welfare, leads us to consider the Babylonian philosophy of life and death. The main difference between God and Man in these early theologies is that a god is immortal, while Man is mortal. On this theme of immortality are built the later episodes in the Gilgamesh Epic.

Briefly, the Gilgamesh Epic, a series of legends worthy to rank with the great stories of the world, appears to have had its origin with the Sumerians, from whom it was borrowed not only by the Semitic Babylonians, who certainly had full editions about 2000 B.C., but also by the Hittites of Anatolia, not many hundred years later. It was re-edited by the Assyrian scribes, and echoes of some parts of it are to be heard in classical mythology, and still more in the Old Testament, which appears to have borrowed the Flood legend almost in its entirety.

The story begins with a description of Gilgamesh, the ruler of Erech at some remote period, so terrorizing the people that their lamentations reach high heaven, and the goddess Aruru then creates out of clay a wild man, Enkidu, who is to deliver the people. He is the brother of the wild, feeding and drinking with them and delivering them out of traps; but one day a hunter spies him, and, returning home overwhelmed with terror, asks his father how he is to cope with this wild man who frees the beasts that fall into his pits.



MUSIC IN THE SERVICE OF THE BABYLONIAN DEITIES

It would be presumptuous to claim that the art of music was first worked out in Babylonia, but certainly at a very early date it was brought to a high pitch of elaboration in the temple liturgies. Probably the tunes, like the words, were very old. Above we see a temple harpist of the time of Gudea.

From De Sarzec, 'Découvertes en Chaldée,' and 'Revue d'Assyriologie'

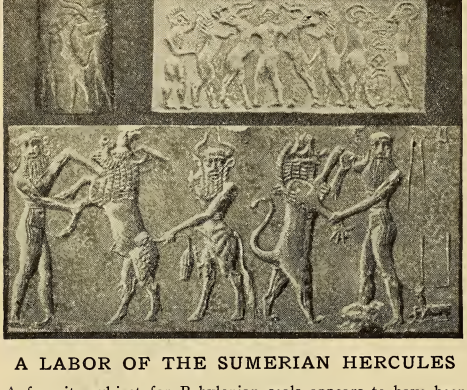
The old man advises a visit to Gilgamesh, telling him what the king will say, and so it falls out. Gilgamesh tells the hunter to take one of the dancing-girls from the cohorts of Ishtar in the temple, and lie in wait for Enkidu at the waterpool; when he sees the girl he will fall in love with her and can then be enticed into Erech.

All happens as Gilgamesh has said that it would, and the dancing-girl persuades the wild man to accompany her to Erech to challenge Gilgamesh. Their arrival in Erech is marked by great curiosity on the part of the inhabitants, and, as has been mentioned, not without the little dig of the editor against the habits of the wild Enkidu, who is taught how to eat and drink and wear clothes like a gentleman.

During the night Enkidu meets Gilgamesh in the street, and there is a tremendous fight between them, in which Gilgamesh appears to get the worst of it. Subsequently they become the best of friends, and set off on an expedition against an ogre called Humbaba, who lives in a forest of cedars which Gilgamesh desires to cut down for his palace. Ultimately they fight Humbaba, Gilgamesh loosing monstrous strong winds against him, and so overcoming him. Humbaba yields and surrenders himself to the mercy of Gilgamesh, but, at Enkidu's counsel that he is so dangerous that he must be killed, they cut off his head.

While Gilgamesh is washing after the fight, the goddess Ishtar lets her gaze fall on him, and desires him to marry her. He, however, taunting her with her past loves, declines, and she flies to her father Anu, in her rage demanding that he should create a divine bull to destroy the hero.

Gilgamesh and Enkidu fight with this bull and kill it; and then it is that in some way, not explained in the text, Enkidu dies, and here begins the quest for eternal life by Gilgamesh.



A LABOR OF THE SUMERIAN HERCULES

A favorite subject for Babylonian seals appears to have been the legendary hero Gilgamesh, tyrant king of Erech. If this explanation is correct, he is either shown duplicated in an heraldic group, fighting a bull or a lion, or else together with another hero (as above) or his satyr-friend Enkidu.

British Museum

Man is but mortal, say the sages, and there are at least three passages in the legends which describe Hades. Two are in the Gilgamesh Epic, and the third is in the pathetic story of Ishtar seeking her lost love in the Underworld.

Unto the dwelling of gloom,
the home of Irkalla,
Unto the dwelling whence
come forth none who enter,
Unto the road whereof the
traverse hath no returning,
Unto the dwelling where
those who enter are reft
of the light,
Where their victual is dust,
their bread is mud,
They see no light as they sit
in the darkness.

Burials at this period (of Hammurabi) were made in clay coffins, rather like a bathtub, and the dead, having been thus consigned to the earth, occupied the miserable abode of which the legend speaks. If they were so fortunate as to have dutiful descendants they would feed on libations and offerings. But if nothing was done for them, and the dwellers on this earth made no offerings to them, they would burst forth from the grave and demand their neglected rights. If their bones were removed from the tomb, the spirits were forced to wander homeless. It was the same if a body was left unburied.

Numerous indeed were the men and women who became wandering ghosts after death: to die of hunger and thirst in prison, to fall into the river and be drowned, to die in childbed, or die a

virgin or bachelor, were all held to be the cause of such misfortune. In any case, these ghosts were able to attack Mankind, particularly those who had been connected with them during life (even merely by eating or drinking with them), and it needed all the efforts of a proper wizard to get rid of their baleful influence.

This is the lot of Mankind. Gilgamesh, therefore, sets off on a journey to learn how to avoid it and obtain eternal life. He has seen his friend Enkidu die, and the terror of it all has overwhelmed him.

GILGAMESH'S STORY OF THE FLOOD

Among the mass of tablets discovered by Layard and George Smith at Nineveh were a series of portions of tablets giving the adventures of Gilgamesh, an ancient king of Erech. On the eleventh tablet (above) of the series is an account of the Deluge as told to Gilgamesh by his deified ancestor, Uta-Napishtim.

British Museum

Shall I, after roaming the desert the way of a wanderer (?)
Lay my head (?) in the bowels of earth, and throughout the years slumber?
O, let mine eyes see the Sun, that I may be fill'd with the sunlight,
(Yea) for the darkness is (banish'd) afar, if the light be wide-spreading
When will the dead see the blaze of the Sun?

On his way he meets an ale-wife, by name Siduri, who warns him how futile it is for Man to seek immortality.

Gilgamesh, why dost thou run? For never the life which thou seekest
Canst thou attain: for the gods in their primal creation of mortals
Death unto mortals allotted, but life they reserv'd in their keeping.
Gilgamesh, full be thy belly.
Day and night long be thou jolly, and each day spread jollity (round thee),
Day and night long do thou dance, and play thee tunes on the reed-pipe,
Clean be thy raiment (and) washen thy head, thyself in the water
Bathe: and be kind to the little one holding thy hand: let thy wife, too,
Joy in thy bosom—for this is the dower of Man.

Ultimately he reaches Uta-Napishtim, the Babylonian Noah, who had been given eternal life by the gods. The sage tells him the story of the Flood, and how it was that he was so favored by the gods. Once upon a time in the city of Shuruppak (the modern Fara), the gods determined to cause a flood, and so destroy the whole of humanity. Ea, however, having compassion on Uta-Napishtim, warns him of the approaching disaster, but, as he is in some measure bound not to reveal the counsel of the gods directly to any mortal, the god comes to the reed hut in which he knows Uta-Napishtim dwells, and tells the story to the walls, and Uta-Napishtim is thus able to hear the warning. He pulls down his house, and with the material, probably the reed bundles of which it was made, builds a boat, and puts all his family on it, with all his property; then the floods descend and all Mankind is blotted out.

Six days and nights did the hurricane, tempest (and) deluge continue
Sweeping the land: when the seventh day came were quellèd the tempest,
Deluge, (aye) warfare which, like to an army embattled, were fighting.

Lull'd was the sea, (all) spent was the gale,
assuaged was the deluge,
So did I look on the day: (lo) sound was
(all) still'd and all human
Back unto clay had return'd, and fen rose
level with roof-beam.

The ship having grounded, he lets loose first a dove, and then a swallow, but both return; then he sends forth a raven, which does not return. He then disembarks and offers sacrifice to the gods. The god Enlil, however, who was chiefly responsible for the Deluge, as soon as he arrives, bursts into wrath at the sight of Uta-Napishtim, the one man whose family has escaped the universal welter of destruction; but he is presently appeased by the comfortable words of the other gods, forgives Uta-Napishtim, and gives both him and his wife eternal life.

But, the sage continues, Who will summon the gods to dower Gilgamesh in the same way? None will; but there is a plant at the bottom of the sea called "Greybeard-turned-young," which will make a man young again. Armed with this information, Gilgamesh goes to the Persian Gulf, ties a stone to his feet like the Bahrein pearl divers, dives in, finds the plant, and carries it off in triumph. But the story-teller, following the correct method of all writers whose heroes discover an impossibility, makes his hero lose the elixir as he takes it home, for a snake darts forth at a pool in which Gilgamesh bathes, and ravishes the plant from his hands. Such is the great story of Gilgamesh and his futile search for immortality. Such a quest is hopeless. As the Epic says, it is true that we shall for ever build houses and set signet to contracts, while brothers will ever share their property in love, there will be hatred for ever between man, the river which has risen in spate will always bring down a torrent; and then, with a rhetorical question, the Epic asks, Surely may not the face which hath once seen the sun last for all time? No; the lot of Man is settled by the gods.

There is little or nothing to mark an advance in thought between the time of Hammurabi and the fall of Babylon; the Semitic mind, so capable of music and poetry, was too conservative to shake off the shackles of anthropomorphism in a religion in which terrorism played such a part. The urge of life was based on a material outlook, wherein thought was fettered by an inert conservatism, and, consequently, mental development was starved.

SURVEY OF EARLY MEDITERRANEAN CULTURES

BRILLIANT CIVILIZATIONS OF WHICH HISTORY HOLDS NO WRITTEN RECORDS REVEALED TO US BY ARCHAEOLOGY

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GEOGRAPHERS treat the Mediterranean Sea as the southern boundary of Europe. This is unsound, both ethnologically and culturally. It would be more accurate to extend the sense of the word "Europe" so as to include the land that borders on the Sahara, and to regard the Mediterranean as a vast inland lake that interrupts the continental land surface but does not terminate it —as though it were a southern counterpart of the Baltic Sea.

Indeed, the interruption of the land by the Mediterranean Sea is, geologically speaking, recent. So late as the Pleistocene Period, in certain of its phases, the sea was divided by continuous barriers of land into a series of enclosed lakes. A traveller could at that time have walked dryshod from the continental area of "Europe" to that of "Africa" across what is now the Strait of Gibraltar, or else over an isthmus of which Italy, Sicily and Malta are the chief surviving relics.

The race among which most of the great civilizations of the ancient world have developed has been settled around this sea, north and south, certainly from the beginning of Neolithic times. Physically, it is distinguished from the other races of Europe by its dark complexion, its long, narrow skull and its comparatively short stature and slender build. It is to be seen to-day in its fullest purity in Spain, but, except in the east, it forms the basis of all the populations whose lands surround the great, almost land-locked sea.

Knowledge of the political history of the shores of the Mediterranean Sea, before 1580 B.C., is of the scantiest. The cuneiform tablets of Babylon, and to a lesser extent the records of Egypt, throw some flickering rays of light upon it from contemporary sources. Classical Greece and Rome have recorded for us some fragments of gossip, telling us what the writers of later date believed about the people who had preceded them. Crete has transmitted to us a considerable mass of documents which must surely contain much of historical value. But she has neglected to accompany her gift with a key such as would enable us to read them: so far nothing has been unriddled but the numerical signs appearing on certain tablets which seem to be inventories.

On the other hand, a long series of brillant archaeological discoveries has established the broad lines of the history of culture round the greater part of the sea. Two great empires, those of Crete and of the Hittites, have been restored to their place in history by the labors of our own generation; in addition to which, from Spain to the Euphrates, facts have been accumulating with such rapidity that it is hardly possible to keep abreast of them.

We must content ourselves in the present chapter with generalities, with a bird's-eye view of the regions bordering on the sea, and it must be said at the outset that, rich though the archaeological harvest of the twentieth century has been, it leaves large gaps in our knowledge. Some of these gaps will perhaps never be filled. Archaeological

evidence is always necessarily incomplete. Wood, textiles, the perishable materials of the majority of written documents, these cannot survive except in unusually favorable circumstances. And the prevalence of cremation in certain regions and archaeological periods has destroyed an incalculable amount of valuable ethnological material over vast tracts of both time and space.

Little is known of the Palaeolithic Age in Asia Minor beyond the bare fact that it existed, and the few excavations that have been made there—those of Troy by Schliemann and his colleagues and successors, of Boghaz Keui by Winckler, of Carchemish by the officials of the British Museum—do not appear to have tapped any purely Neolithic stratum.

At Sakje Geuzi in North Syria, excavated by Garstang, the two lowest layers are Neolithic, but probably not of the earliest phases of the Neolithic Period. They yield implements in obsidian, bone objects, and sherds of black pottery with incised linear ornament. The later Neolithic layer showed colored pottery, adorned with straight or wavy lines, and patterns of dots, painted in black on a buff ground. But until a much greater number of sites is explored, it will be impossible to say where these wares fit into a historical scheme.

A new culture spread gradually over the nearer East, on the border-line between the Age of Stone and the Age of Metal. The characteristic of this change is the supersession of the earlier black ware by ware of a red color. This change is attributed, primarily, to an improvement in the firing of the pottery, resulting, presumably, from improvements in the potters' kilns. The earlier ware had been baked in an open, smoky fire. The surface of the vessels so treated had been stained black by the smoke; the stain, having been accepted by the potters as inevitable, was merely made uniform by artificial means. In the new kilns, the presence of iron oxide in the clay produced a red color in the ware. This, in its turn, was made

CULTURE AREAS OF THE EARLY MEDITERRANEAN ZONE

During the centuries through which the course of events in Egypt can be followed, there were Mediterranean communities whose cultural development can be synchronized with whatever Egyptian dating is adopted, though of their history in the restricted sense nothing is known. Yet they were not isolated for the Minoan culture was much influenced from Egypt and the Cycladic from the east; the Helladic first from the Cyclades, then from Crete.

uniform by washes or otherwise, and was burnished.

In the basin of the Danube, in Turkistan to the east and in Syria to the south, this red ware corresponds in time with the first appearance of metal tools. No inscription, however long it might be, and however full in historical details, could be so eloquent of the movements of peoples and of trade intercourse as these red potsherds, collected together from sites so far apart. They are judged to date approximately from 4000-5000 B.C.

The earliest center of historic interest in the peninsula is the region which in classical times was called Cappadocia. In or about the middle of the third millennium B.C. the Sumerian kings of Babylonia extended their empire to include Cappadocia, and a large number of clay tablets, bearing documents in the cuneiform script, have been found there. Although these tablets are in the Semitic Babylonian language, they present certain linguistic peculiarities, due to the contamination of some foreign tongue, presumably one of the dialects collectively known as "Hittite." Besides these linguistic peculiarities, there are revealed details of social life which likewise indicate non-Semitic associations.

Thus it is in Cappadocia that we first come upon the track of that mysterious people whose empire was destined to spread over practically the whole peninsula, and to interrupt for once its otherwise unbroken record as a seething cauldron of irreconcilable ethnical elements. Eastern and Western here meet, and here form inextricable mixtures. Asia Minor is at once, if we may be permitted the paradox, a thoroughfare and a cul-de-sac. It is a road whereby Europe may enter Asia; it is a barrier which closes Europe to the westward march of the Asiatic. Here, on a non-European soil, and amid incongruous non-European surroundings, the Ionian Greeks eventually laid the foundations of European literature.

So far as we can reconstruct it, the history of Asia Minor has almost always been the history of the squalid jealousies of small communities, turned by some dominant power in the background to its own advancement and aggrandizement. In the time of the Hittite Empire only has there been any pretence of unity.

THE HITTITE TYPE

Not themselves of Mediterranean type, the Hittites were an important Anatolian people who came to dominate much of the Asia Minor coastland. Their statues show them buskined, belted and wearing a high hat.

Berlin Museum

We know the names, but little more, of communities which existed before the establishment of the Hittite Empire in Asia Minor. Fifty years ago the name of the Hittites themselves was not much less obscure. It was, of course, familiar, but only as that of a small community in Palestine with which Abraham had dealings, and which was among the peoples whose territory was promised as a heritage to the Israelites during their desert wanderings.

With the decipherment of Egyptian and Babylonian records it began to be clear that the Hittites must have been something more than this—at least, that there must have been a people of the same name, of which the Egyptian monarchs, for all their chauvinism, could not choose but speak with respect. But no tangible remains of this people were recognized until 1872.

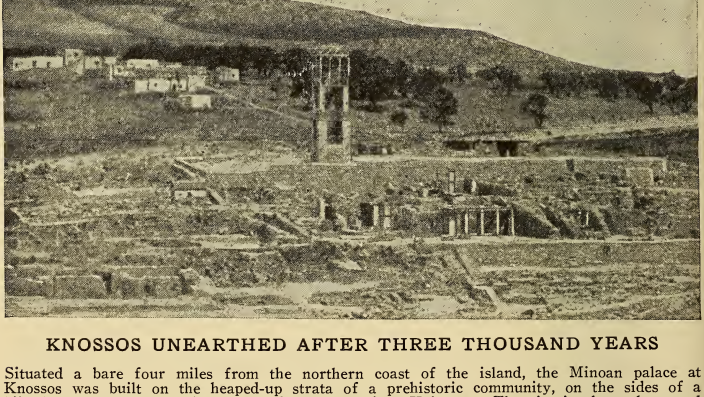
In that year Dr. William Wright, a missionary of the Irish Presbyterian Church in Damascus, made the suggestion that certain remarkable inscriptions and sculptures, discovered from time to time in North Syria and Asia Minor, were of Hittite origin. Wright's suggestion was at first received with

scepticism, if not with ridicule; but it was supported by the championship of Sayce, and in later years the excavation of Boghaz Keui has shown that it was one of those brilliant flashes of insight which foresee a truth before it can be mathematically proved. The wealth of material that Boghaz Keui has yielded to its explorers includes a library of no fewer than 20,000 tablets.

From these inscriptions and sculptures we learn that there had been a notable civilization extended over almost the whole of Asia Minor, for the extent of its remains covers nearly its entire area, from the Mediterranean to the Euphrates, and even some little way across that river. The sculptures reveal to us their kings and their gods, with heavy, rather stupid-looking Mongolian-like faces, often adorned with huge beards. Nevertheless, they were good soldiers and admirable metallurgists. They were sufficiently civilized to have a formal code of laws, and their rock sculptures, though apt to be clumsily massive in effect, show no small command of the elusive quality of "life," especially in the representation of animals.

Contemporary with this Asiatic power there are settlements of a different type in the regions of Asia Minor bordering on the Mediterranean. Of these the best known is Troy, and although Troy and its civilization had elements cognate with the civilizations of Crete and its dependencies, it is not identical with them; elements which are native to Asia Minor predominate, and are mixed with others from the region of the Danube.

Archaeologically, Crete is the center of interest in the eastern Mediterranean. As yet no evidence of a Palaeolithic occupation of the island has come to light; but in the Neolithic Period it must have been very populous, and the Neolithic stage of Cretan culture, if we may judge from its great depth of accumulation, must have been of long duration. At Knossos there was a Neolithic stratum which at one place was no less than 26¼ feet in thickness. If this great mass of debris had accumulated at the same rate as the later strata of the Bronze Age, the Neolithic occupation of the site of Knossos must have lasted about 5,000 years; and if we take 3500 B.C.



KNOSSOS UNEARTHED AFTER THREE THOUSAND YEARS

Situated a bare four miles from the northern coast of the island, the Minoan palace at Knossos was built on the heaped-up strata of a prehistoric community, on the sides of a hill that slope down to the valley of the little river Kairatos. The site is about three and a half miles by road south of the present Candia. The skeleton tower shown in this photograph was built by Sir Arthur Evans to enable the excavations to be viewed as a whole; the portico and staircase of the 'Queen's Apartments' below it have been skilfully restored.

Photo, G. Maraghianni

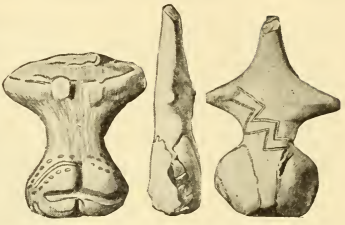
as an approximate date for the end of the Neolithic Period, that would bring us back to something over 8000 B.C. as the date of its beginning.

Even this remote date does not mark the first appearance of human life on the island, for there are other Neolithic sites—open-air villages, single habitations and cave dwellings—some of which belong to a yet more primitive stage of Neolithic civilization than happens to be represented at Knossos. We must go back still further—say, about two centuries—for the earliest datable remains.

Despite the fact that the Neolithic folk of Crete had no metals, they were not primitive barbarians. They polished their stone tools, and made pottery which, within its limitations, was aesthetically attractive as well as useful. Spools and spindle-whorls of clay show that they could spin and work in textiles, although naturally the perishable products of this industry have not survived. Chipped implements of obsidian testify to an oversea trade with the island of Melos.

Like other Neolithic peoples of southern Europe, those of Crete made idol figures of the divinities whom they worshipped, and these give us information regarding their skill in the plastic arts as well as their religion. So far as the former is concerned, we cannot say that the Neolithic Cretans took a high place; but amorphous though their idols may be, they possess great value for us. They show us that the dove and the ox were already considered sacred, and that a female divinity was worshipped—presumably a goddess of fertility, who is represented with the lower limbs absent or absurdly shortened, perhaps to suggest the attitude of squatting. The figure as a whole assumes a shape resembling the body of a violin. Such figures are widespread throughout the Mediterranean basin; though simple in form, they exhibit a variety of types, and the study of their interrelations presents some difficulties.

The name "Minoan" has been given to the phases of Bronze Age civilization which succeeded the Neolithic in Crete, for the great legendary tyrant and lawgiver Minos occupies the center of the stage in the later traditions of Crete,



IDOLS OF THE CRETANS

Two of the Neolithic Cretan types of female idol are here shown: that on the right seems to indicate a sitting or crouching attitude, that on the left a squatting position with feet drawn under the body.

From Evans, 'Palace of Minos,' Macmillan

as they are given to us by the writers of Classical Greece. During the Bronze Age the island had its vicissitudes. More than once its cities and its palaces were sacked, necessitating complete reconstruction. These turns of fortune are reflected in the varying phases which the history of the Minoan culture presents. This history is divided, for the sake of convenience, into three major periods, each subdivided symmetrically into three minor periods, making nine in all, as follows:

EARLY MINOAN	.. ..	I, II, III
abbreviated	E.M. I ..	c. 3600–2800 B.C.
"	E.M. II ..	c. 2800–2400 B.C.
"	E.M. III	c. 2400–2100 B.C.
MIDDLE MINOAN	.. ..	I, II, III
abbreviated	M.M. I ..	c. 2100–1900 B.C.
"	M.M. II ..	c. 1900–1750 B.C.
"	M.M. III	c. 1750–1600 B.C.
LATE MINOAN	.. .. ..	I, II, III
abbreviated	L.M. I ..	c. 1600–1450 B.C.
"	L.M. II ..	c. 1450–1350 B.C.
"	L.M. III	c. 1350–1200 B.C.

Approximate dates have been fixed for these periods by their association with Egyptian objects, according to the scheme of Egyptian chronology in use in this work. From the first the Cretans maintained trade relations with Egypt; imports from each country are found in the other, accompanied with native products that teach us what styles and types were contemporary. We cannot yet read the inscriptions on the Cretan tablets; but those of Egypt can be deciphered, and from that coun-

EARLY MINOAN SEALS

Seals appear in the very early days of the Minoan culture in Crete. Two faces of a prism-shaped seal (E.M. I) are shown on the left, and an Egyptian seal found at Karnak is added for comparison (right).

From Evans, 'Palace of Minos,' Macmillan

try we can get some approximation to a fixed chronological scheme.

From these comparisons we learn the remarkable fact that throughout their history the two countries rose and fell together. Egypt passed through alternating phases of glory and eclipse. The great days of the Old Kingdom are succeeded by the confusion of the dynasties between the Sixth and the Eleventh, which are almost blank pages in the history of the country. The Middle Kingdom follows with its grandeurs, only to be succeeded by the evil days of the Hyksos domination. After this there is a final blaze in the New Kingdom, and then the book of the greatness of Egypt is rolled up and sealed for ever with the signet of Ichabod. In Crete, the climax of the Early Minoan is contemporary with the pyramid builders of the Old Kingdom, and its latter end (E.M. III), which shows decided deterioration, with the obscure period that followed them. The Middle Minoan at its highest and the Middle Kingdom of Egypt exchange their wares, and the Late Minoan, in which the Cretan tradition gloriously perished, corresponds in time with the end of Egyptian greatness in the New Kingdom.

It is not improbable that climatic oscillations are the ultimate cause of the influences which produced these fluctuations; this would account for their synchronism in the two centers.

In the beginning E.M. I is but little more than a development of the preceding Neolithic culture: copper, however, has come into use, though still in restricted quantities. The pottery is still hand-modelled, the potter's wheel not having yet been introduced. It is, however, better fired, and shows indications of an improvement in the potter's kiln. Two influences can be traced in the ornamentation of the vessels—the influence of wood and of metal work. We may suppose (though, naturally, owing to the decay of the material, we cannot prove) that wooden vessels were in use as well as vessels of pottery; they are freely employed in southern Europe and western Asia at the present day. Idols are found, similar to the Neolithic clay figures; but many of these are now made of stone, and the modelling, though still rude, is, on the whole, less degraded.

Already the Cretans had begun to use seals of steatite, engraved with various figures, in which may be seen the germ that was afterwards to develop into a

PROBLEMS SET BY MINOAN POTTERY

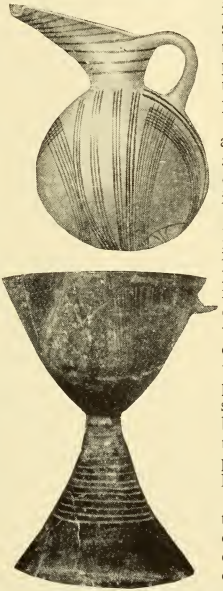
The pottery of E.M. II, besides its greater variety of shape and painted decoration, possesses a peculiar mottled coloring, as in the left vase, produced by skilful variations in the firing.

From Boyd Hawes, 'Gournia,' and Seager, 'Mochlos'

system of writing. The figures represent various living forms—men, quadrupeds, scorpions, insects, etc.—as well as fantastic devices to which it would be difficult to attach a name. There are elements in the decoration and form of these seals which link them with similar products in Egypt and in Mesopotamia, so that already in the fourth millennium B.C. trade relations with these centers of civilization had been established.

E.M. II shows us the Minoans well embarked on their great career. In every department of human life that can be illustrated by excavation there is evidence of a marked advance. Pottery is much more shapely than before, and it shows a vastly increased variety of form and an elaboration of painted ornament. As in E.M. I, this consists of combinations of dark lines over a light background. In addition to this more ordinary form of ornament, a new decorative device makes its appearance. It consists in skillfully diversifying the intensity of the firing of the vessel, thus producing a play of different colors in the surface of the ware itself.

The aesthetic sense of the Minoans of E.M. II was incomparably higher than that of their predecessors in E.M. I. The plastered surfaces of house-walls were washed over with red paint—not a great thing in itself, but the beginning of an artistic movement which culminated in the wonderful frescoes of the palace chambers. Charming ornaments in gold leaf, cut into the shape of leaves and flowers, are found in the tombs. The seals cannot be said to have advanced much further toward perfection, but, on the other hand, there have been discovered some remarkable realistic figures of animals, carved in the round from soft stone.



FASHIONED WITHOUT THE WHEEL

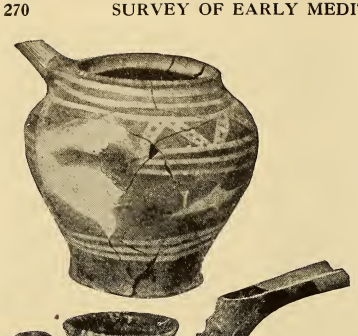
This E.M. I pottery was made without the potter's wheel. Simple linear decorations (top) had by now appeared, and sometimes, as on the chalice (bottom), these seem to imitate wood graining.

From Evans, 'Palace of Minos,' Seager, 'Mochlos,' and Prof. F. Halbherr

In E.M. II the Early Minoan period reached its climax, for the evidence shows that E.M. III was a time of retrogression, and, as we have already noted, it was contemporary with a similar retrogression in Egypt. E.M. II had shared the world, as it was then known, with the great pyramid-building kings of the Fourth Dynasty. The people of E.M. III saw the turmoil which Egypt suffered, and which broke up the civilization of the Old Kingdom, during the Sixth and following dynasties.

But while the traditions of E.M. II were gradually fading during E.M. III, the later period still contained within it the seeds of the grandeur of the Middle Minoan. A very remarkable rock-cut chamber, found underneath the palace of Knossos, may possibly indicate that already some important structure had been built on the site, although the history of the palace as we know it begins later.

Now the pottery decoration completely changes its character. In the two preceding periods it had chiefly consisted of dark lines painted over a light background. We now find the background painted over with a dark wash, and the designs in light-colored lines contrasting with it. Among these designs, the spiral makes its appearance on the island for the first time. Now the seals are engraved with a surer touch, and some striking symmetrical patterns are evolved, including several which show a labyrinthine pattern. This is important, in view of the traditions associating Crete with the labyrinth of Minos and the Minotaur, and of modern theories connecting the labyrinth of folklore with the palace of fact. It has been too lightly assumed that the late legends are merely reminiscent of the



POTTERY OF EARLY MINOAN III

In the latest stage of the Early Minoan period pottery decorations made a new departure. Instead of dark lines being painted on a naturally lighter background, the whole background was now given a dark wash, with lighter lines, often spirals, painted thereon.
Candia and British Museums

palace. But while the labyrinthine palace of Knossos might have served as a concrete realization of the labyrinth of ancient tradition, that vast and highly complicated structure cannot be the actual origin of the labyrinth conception, for when the seals were cut it was not as yet in existence. The architects of Knossos may have built the palace to the specification of the labyrinth idea, but the labyrinth idea must have preceded the Palace of Knossos.

M.M. I at once surpasses all the achievements of the Early Minoan periods. The great palaces begin to take their shape. A system of writing is developed. Art makes giant strides. The comforts and luxuries of life are cultivated to an extent unparalleled in any other ancient civilization. The Palace of Knossos, for example, was supplied with water conveyed in pipes which were better adapted, as Sir Arthur Evans claims, for preventing the accumulation of sediment than the water-pipes of modern cities.

Pottery shows an extraordinary range of shape and decoration. Polychrome coloring now first appears, and the designs include zigzags, spirals and other geometrical figures, as well as attempts at realistic figures of beasts, birds and fishes—not, perhaps, uniformly successful, but often extremely good. Moulded decoration is also applied at this time to the surface of the ware.

Of especial interest are the seals. They often depict scenes of human life—acts of worship or the like—and they permit us to see the Minoan men in their simple loin-cloths and the women in their heavy, many-flounced dresses. Religion, also, begins to take new forms, if we may judge from the assiduous cult of certain sanctuaries, caves and other places of pilgrimage, traditionally associated with this god or that. Devotees leave behind votive gifts, which the inquisitive archaeologist carefully garners with great profit to science. With the reawakening of a feeling for art and culture, and a realization of the complexity of life, there must have arisen a desire after the unseen more intense than ever before. The old rudimentary cults of simpler days now failed to satisfy; men sought rest for their troubled spirits in toilsome pilgrimages, and in devoting precious gifts to their gods. This must be the motive that we can trace behind the cult of the cave sanctuaries at the beginning of the great days of Knossos.

M.M. II develops and extends the contributions to civilization and art made by its predecessor. The great palaces, begun in the earlier period, are completed. They consist of vast complexities of rooms, as a rule long and narrow, opening out of truly labyrinthine corridors and lying around a great central court. Staircases lead down to underground cellars, and up to a second story. It is not too much to say that comfort and luxury were studied with a greater completeness than ever before in the history of the world. Thus the palaces had a system of sanitation superior to that of any other ancient civilization—superior, indeed, to that of any medieval European city. There was a

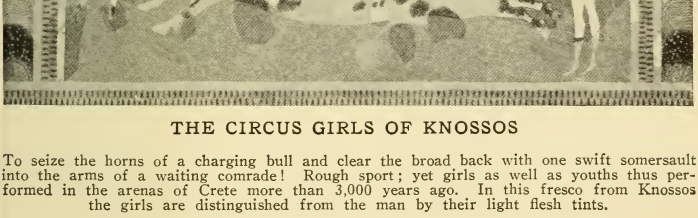
royal reception hall; there was a private theater, where the inmates of the palace were entertained with bull fights in which, as wall paintings show, girls as well as youths shared the dangers. Though the palaces met with violent ends, which involved their looting by foreign ravagers, a sufficiency of relics was left for the archaeologist to deduce the luxurious life of the occupants.

Enormous jars stood in the storechambers, with provision for the great household which the maintenance of the palace must have required. In appropriate receptacles were stored the carefully compiled inventories and stewards' dockets of the household goods.

The pottery of M.M. II is marvelous. It is of almost every shape, displaying almost every possible variety of ware and of ornament. One type, smooth and hard as an eggshell, is undoubtedly an imitation of metallic forms. The painted decoration, especially in the variety named after the cave of Kamáres (where it was first discovered), defies description, so elaborate is its mosaic of colors and forms, geometrical and floral. As regards the geometrical figures the spiral holds a prominent place.

Among the most interesting discoveries belonging to this period made at Knossos were the relics of a tiled floor which had contained, among other things, a view of a town with its fortifications and its houses. This picture shows us, not the palaces, but the dwellings of the ordinary citizens who lived under the sway of the lords of the palaces. The houses themselves have long been razed to the foundations which an excavator lays bare, so that had it not been for this floor design we should not have known that they rose to two or even sometimes to three stories in height, with window-openings in each story and sometimes with small roof attics in addition; that, in fact, if by some time-machine we could visit a Minoan town in the days of its glory, we should find it presenting an appearance not very unlike that of a modern south European or Near Eastern city.

Houses are decorated on the front with horizontal stripes, reminding us of the "zebra" style of decorative building that was affected by some nineteenth-century architects, though probably indicating some form of framed timber construction. The bottom story has no opening but the house door, in the center of the wall. Its rooms, as a rule, were not lighted by windows opening on to the street, doubtless to avoid the gaze of the inquisitive, or the operations of burglars. Above, there are



THE CIRCUS GIRLS OF KNOSSOS

To seize the horns of a charging bull and clear the broad back with one swift somersault into the arms of a waiting comrade! Rough sport; yet girls as well as youths thus performed in the arenas of Crete more than 3,000 years ago. In this fresco from Knossos the girls are distinguished from the man by their light flesh tints.

From H. T. Bossert, Alt Kreta

POTTERY UNEXCELLED FOR TASTE AND CRAFTSMANSHIP

The crowning successes of Minoan pottery were achieved in the period M.M. II. The ware is uniformly superb—fine, hard and even, sometimes almost of egg-shell thinness and texture. Smooth metal originals are often imitated, but what a photograph best displays is the painted decoration, especially on the exquisite Kamáres ware like the large jar in the center. The patterns are geometrical, the spiral predominating, but lightened and diversified by floral motives.

Candia Museum (photos, G. Maraghianni) and British Museum

two or three windows, lighting the second story; if there be a third story, there are corresponding windows above these. These windows are rectangular, and are subdivided into four or six small squares, indicating that they were fitted with frames containing either lattices or some sort of window-paning.

In the transition from this period to M.M. III, while the invasion of the Hyksos brought to a close the brilliant civilization of the Egyptian Middle Empire, the palaces of Crete were reduced to ruins, and for a while were desolate. But this catastrophe, which is believed to have been due to a great earthquake, did not involve a breach in the continuity of civilization. M.M. III is not a fresh civilization; there are changes in detail, but, on the whole, the ancient traditions are maintained unbroken.

Knossos was rebuilt with, if anything, greater complexity and magnificence than before. The grand main staircase, which is among its most striking architectural features, and some of the most famous of the wall paintings are to be assigned to this period. The great royal draught-board, the finest portable work of art which Knossos yielded, is also referred to this period by Sir Arthur Evans, although some of the objects with which it happened accidentally to be associated, in the spoiler's "dump" where it was found, belonged to L.M. I.

Once again we may trace further experi-

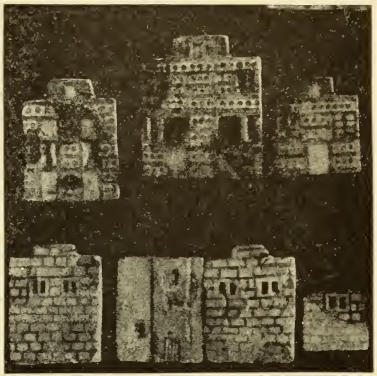
ments in the field of religion. The favorite deity is now an unpleasant being whom explorers have labelled provisionally "The Snake Goddess," until the decipherment of the tablets shall reveal her real name. She is represented in the Minoan many-flounced dress, cut low so as to expose the breasts, with snakes twining round her arms, waist and head-dress, or wriggling in the grasp of her hand.

Sacred symbols are much in use in this period, especially the cross and the double axe. The coincidental use of the cross as a symbol in pre-Christian times is a well-established fact, though it is not a matter to which much importance need be attached. But it is certainly startling to enter a chamber which appears to have been a sanctuary of this snake goddess, and to find a large cross as its central symbol.

Pottery shows a decline in technical excellence. Whatever the catastrophe may have been which submerged Knossos at the end of M.M. II, it seems to have involved the potters and their traditions in ruin. The artists of the new period turned their attention to the making of faience, while their masters apparently preferred vessels in metal or in polished stone. Still, the pottery of the period shows some interesting and curious developments. In the first place, the polychrome decoration has for the greater part disappeared. There are a few survivals, but these merely serve to point the contrast. Secondly, there is a marked growth in naturalism in presentation, as opposed to the artistic conventionalism of the earlier decoration.

We must regard it as affording an indication of a decline in taste that pottery vessels are sometimes skillfully painted to imitate the veining of polished marble. There are also realistic paintings of flowers, especially lilies, and life-like representations of flying-fish, octopuses, dolphins and other marine creatures. It is strange that the artists sought no inspiration from the human figure, or from terrestrial beasts and birds. With some reason it has been suggested that there may have been a religious taboo which forbade the free use of such subjects.

Writing was freely used; we may judge this from the scribbles found upon house walls even more than from the formally kept inventories and archives. The latter are from the hands of professional scribes; it is their business not only to write, but also to read what is written to the magnificent but possibly illiterate princes and nobles whom they serve. But wall scribbles are the work of the man in the street, and so far as they are meant to be read at all, they are meant for the perusal of the other man in the street; the existence of wall scribbles on an ancient site is, therefore, the most indisputable evidence possible of a general diffusion of a knowledge of reading and writing.



HOMES OF THE MINOANS

The most impressive discovery of Middle Minoan relics was the scattered pieces forming the inlay of a mosaic pavement. This originally represented a Cretan town by the sea, and from a study of the remains we learn that as early as the eighteenth century B.C. Cretan citizens had large houses of timbered masonry, consisting of several storeys.

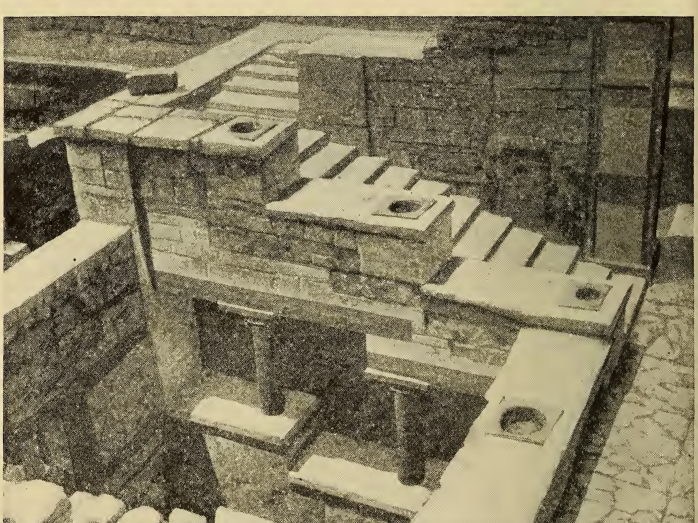
To this period belongs the famous Phaestus Disk, which was found in the palace of Phaestus. It is a flat, circular tablet of terra-cotta, six inches in diameter, with a spiral band roughly traced on each face. Upon this band there is impressed an inscription in some form of picture writing, of which no other example is known, in Crete or elsewhere.

Forty-five different characters are used; and these have been impressed upon the clay, not with a clerk's stylus (like the characters of a cuneiform inscription), but with stamps or seals, which must have had some general resemblance to the sets of stamps with which bookbinders print titles upon the backs of books. The Phaestus Disk may fairly be described as the oldest example of printing from movable types in the world.

The Late Minoan periods began in a manner worthy of their great predecessors, and, indeed, it is to the Late Minoan that some of the most striking of the relics which Crete has preserved for us are to be assigned. At Knossos itself an extraordinary harvest of seals and sealings carried on the earlier tradition. Though inferior, perhaps, to the M.M. III seals in number and in variety, they are still of high value as specimens of the miniature art of their time and of contemporary life and beliefs.

Much more important than these are the inscribed clay tablets. For the greater part the documents appear to be palace inventories. Reference must be made to Sir Arthur Evans' publications—particularly "Scripta Minoa" and the fourth volume of his monograph on "The Palace of Knossos"—for particulars as to this writing with its strange shapeless characters; let it be sufficient here to say that the linear script of Crete—so called to distinguish it from the hieroglyphic pictorial script of earlier periods—begins to appear in M.M. III.

The subject of Late Minoan culture is treated of in the chapter on the Minoans and Mycenae (*See* Vol. II), by Professor J. L. Myres.

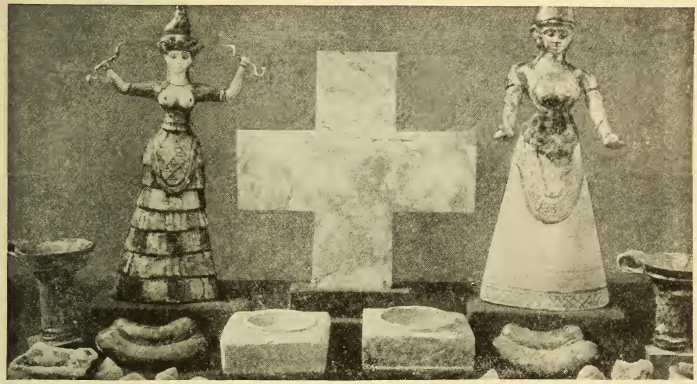


NOBLE STAIRWAY IN THE PALACE OF KNOSSOS

Built as it was on the slope of a hill, it was not so difficult for the palace architect to give his structure several storeys, approached by noble flights of stairs. There is evidence that such stairways were a feature of an earlier palace on the site (M.M. II), but it is from the remains of the Middle Minoan III palace that the structure shown in this photograph has been so successfully rebuilt.

From Sir Arthur Evans, 'Palace of Minos,' Macmillan & Co., Ltd.

With L.M. II the greatness of Crete came to a noble end. The throne-room and the cup-bearer fresco at Knossos itself, and the famous gold cups with their scenes of bull-hunting and of peaceful cattle, found at Vaphio in Sparta but most likely of Cretan origin, are enough to show that Cretan art still had plenty of vitality. But the end came, and came suddenly. The blackened ruins led at first to the conclusion that raiders from the mainland had cut the life of the palace short. But Sir Arthur Evans, with his wonderful "detective" insight into the past, has reconstructed a different tragedy. Some rite of anointing was about to take place in the throne-room; the alabaster ointment vessels were in position, ready to be filled from the great jar which had been brought up from the store, when suddenly the house reeled under the stroke of one more appalling earthquake. Something—an overturned brazier, maybe—kindled certain of the timbers in the furniture or the con-



SNAKE CULT STATUES OF THE MINOANS

What seems to have been a repository of the M.M. III palace shrine at Knossos contained the remarkable objects shown above. The cross used so early as a religious symbol is deeply interesting. Above is an ivory and gold statuette of the Snake Goddess.

Photo, G. Maraghianni (Candia Museum); Boston Museum of Fine Arts

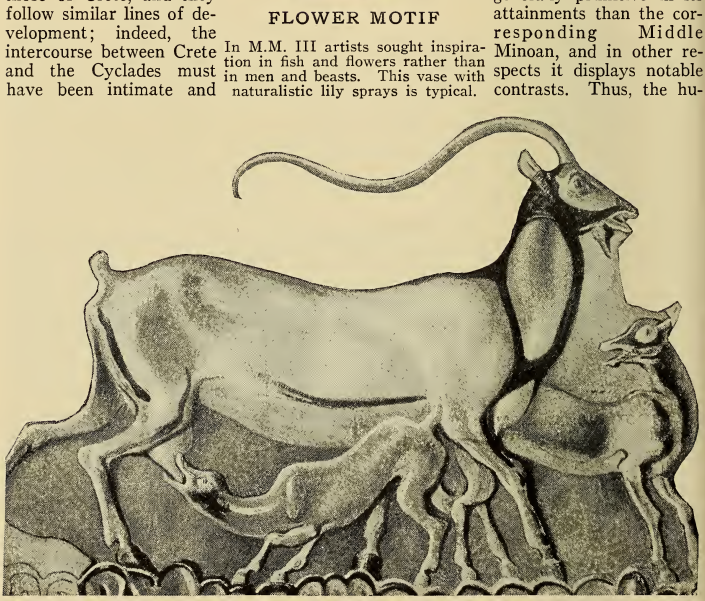
struction; a violent wind fanned the flames, and the palace was reduced to ashes.

We now leave Crete and proceed northwards to the islands of the Cyclades. These early became centers of trade in the commodities which they yielded in abundance. Paros and Naxos supplied marble; but, still more important, Melos supplied obsidian, the best substitute for flint. Such remains as excavation has yielded in these islands are closely analogous to those of Crete, and they follow similar lines of development; indeed, the intercourse between Crete and the Cyclades must have been intimate and constant. Parallel with the Early, Middle and Late Minoan Periods are the Early, Middle and Late Cycladic.

FLOWER MOTIF

In M.M. III artists sought inspiration in fish and flowers rather than in men and beasts. This vase with naturalistic lily sprays is typical.

But while following lines parallel with those of the Cretan arts, those of the Cyclades are not identical with them. They are, on the whole, of inferior merit, and altogether more primitive. In the Early Cycladic there is evidence of Egyptian influence, which, however, is insufficient to leaven its style. Middle Cycladic is likewise more generally primitive in its attainments than the corresponding Middle Minoan, and in other respects it displays notable contrasts. Thus, the hu-



NATURALISTIC RENDERING IN FAIENCE

A fashion for faience seems to have been one of the reasons that led to a decline in the austerer beauties native to pottery during M.M. III; but some of the faience panels, though florid, are certainly masterpieces. This specimen, from Knossos, is of a Cretan wild goat with her two kids, one of which she is suckling.

From Annual of British School at Athens

man figure is avoided in Cretan pottery; it is freely used by the Cycladic artists. Despite these differences of detail, the Cycladic culture is closely cognate with Crete's.

Rather more remote from the Cretan standard is the civilization of Cyprus. There is apparently no known trace of the Palaeolithic Period in the island. The Neolithic Period is represented, but its remains are poor, both in quality and in quantity. It was not until the introduction of metallurgy that the island sprang into importance and wealth, thanks to its rich store of copper. Indeed, the name of copper, in most European languages, is derived from that of this island, so closely is the metal associated with it.

There is a marked and extensive Copper Age in Cyprus, corresponding to the Cretan Early Minoan, followed by two civilizations in which both copper and bronze are found in use. A clearly demarcated Bronze Age cannot be distinguished before the advent of Late Minoan colonization. Metallurgists and potters in Cyprus were expert craftsmen; especially the latter. Pottery with characteristic decoration of Cypriote origin has been found in all the countries surrounding the island, from at least 1500 B.C. onward. Cyprus also possessed a peculiar form of writing of its own.

On the mainland of Greece scanty Neolithic remains, including painted ware, have been found in the south. The Bronze Age civilization of the southern parts of Greece is divided into the Helladic periods, which follow a course of development similar to that in Crete and the Cyclades, but with differences of detail. The Early Helladic ware is of coarse texture, made without the potter's wheel, and bearing incised ornament of simple type. Afterwards, a glaze paint is introduced. The patterns are painted in dark color on a light background. The Middle Helladic is characterized by a smooth, wheel-made ware, usually grey in color, polished and without colored decoration.

In northern Greece there is another center of civilization, the history of which has been worked out by the researches of Wace and Thompson. They recognize four Thessalian periods, the first two Neolithic, the others Bronze Age. In the First Thessalian there are all the usual stone implements, some of them in obsidian—an indication that trade oversea with Melos had been established.

ENIGMATIC PHAESTUS DISK

This clay disk, discovered at Phaestus in a M.M. III context, is covered with so far undeciphered signs running in spiral bands—not engraved but impressed with separate dies, the first use (so far as is known) of movable type.

Photo, G. Maraghianni

Unlike the countries with which we have been hitherto concerned in this chapter, the Palaeolithic Period is well represented in Italy, but with some remarkable limitations. There are many sites in which remains of the Lower or Early Palaeolithic Age have been found, especially in the south of the peninsula. On the other hand, the Upper or Late Palaeolithic Period has a very imperfect record. Only the earliest phase, the Aurignacian, has been recognized with certainty, and no trace of the pictorial art which is so strongly represented in Spain has been found in Italy.

Rich remains of the Neolithic Period exist over the whole of Italy. These consist of dwelling-sites, both caves and

huts, as well as graves. These dwellings contain implements in flint—daggers, scrapers, knives, axes, etc., as well as objects in obsidian and bone. Great care was taken over burials. The graves consist either of caves or else of stone-lined trenches; the dead are usually laid in a crouching posture, and are accompanied with grave-goods, which are frequently broken with intention. The purpose of this is to liberate the spirit of the object, whatever it may be, in order that it may be of use to the spirit of the dead man. The rite thus graphically teaches us that a spiritualized, non-material conception of the state of the dead had already been evolved.

As elsewhere, the Stone Age is succeeded in Italy by a Copper Age, in which, in addition to the introduction of metal, we find other innovations of importance. The hut dwellings maintain their previous character; but among the tombs, in addition to burials in natural caves and in earth trenches, we now begin to find artificial rock-cut burial places. This points to foreign influence from the east of the Mediterranean, where such tombs had long been in use.

The Bronze Age in northern Italy is principally exemplified by the lake-dwellings of lakes Maggiore, Como, etc., and by the remarkable pile-villages called terramara settlements.

MINYAN AND THESSALIAN WARE

On the mainland of Greece excellent pottery was produced (left). Examples of the so-called Minyan or Middle Helladic and Thessalian vases (see page 277) are also seen above. Typical of the best Minyan pottery is the flat grey dish with high upstanding handles (top right); the bowl upon which a wavy design is incised is Thessalian.

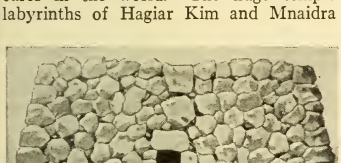
British Museum

Sicily is separated only by a narrow channel from Italy, yet its Neolithic culture is, if anything, more closely cognate with that of Crete than of Italy. The small island of Pantelleria possesses a remarkable series of masonry structures locally called "sesi." These are, in outline, a truncated cone, circular or elliptical in plan, containing one or more burial chambers approached by a passage to which a doorway on the outside gives access; the remains found within them suggest a Neolithic date. The Copper Age in Sicily is of great importance, and displays notable individualities, especially in the design of the rock-cut tombs.

Sardinia, the Stone Age of which is little known, is distinguished from Italy by the presence of rude stone monuments, such as are almost absent from the mainland. Standing stones and dolmens are common; in addition to these must be mentioned the remarkable fortified dwellings called "nuraghi" and the Giants' Graves which are essentially the same as the rock-cut tombs, but differ from them in being built of large stones instead of being rock-cut. The Balearic Islands possess structures locally called "talayots," which resemble

in appearance the Sardinian nuraghi, though differing in character. Megalithic remains are also numerous in the island of Corsica.

But it is Malta which presents the greatest number of problems for consideration. This little island possesses some of the most remarkable megalithic structures in the world. The huge temple labyrinths of Hagiar Kim and Mnaidra



TOMB IN PANTELLERIA

Believed to be Neolithic, the 'sesi' on the island of Pantelleria are of solid masonry with an outer casing of large blocks of stone; as seen in this example, they are pierced by narrow passages leading to the sepulchral chambers within.

From T. E. Peet, 'The Stone and Bronze Ages in Italy'

are unique, and, far more even than Stonehenge, create an impression of mystery inscrutable. No less marvelous is the rock-cut complexity of chambers called Hal Saflieni. These vast works exist, but that is almost all that we can say of them; they guard their secrets well.

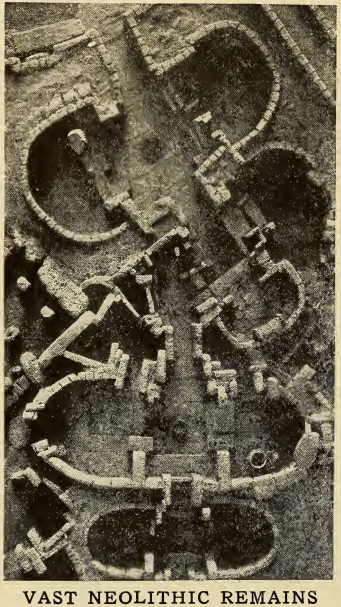
Archaeologically, Spain is one of the most important countries in Europe. It has ever been a half-way house. It lies on the most obvious route between Europe and Africa; it was also an intermediary between northern Europe and the civilizations of the Mediterranean. Its wealth of metals early gave it an exceptional position, and made it a commercial clearing-house. From the earliest Neolithic days Spain was linked with Ireland, and almost as early it had established connections with the eastern Mediterranean.

In the first place, unlike most of the other Mediterranean regions with which we have been concerned in this chapter, Spain possesses Palaeolithic remains of the first rank. Secondly, the Neolithic and Bronze Ages have enriched Spain with some of the finest dolmens in the world; and there are many remarkable types of pottery, implements, idol figures, etc. The tin mines of Spain were among the chief sources of this metal, which was an

CYCLADIC POTTERY OF VARIED FORM AND USE

Influenced in its early stages by Egypt and to a greater extent throughout by Crete, the pottery of the Cyclades underwent consistent development, yet never achieved the refinement and beauty of its models. The geometrical decoration, for example, painted or incised, remained uncouth. Most characteristic is the oddly shaped jug (top); the large candelabrum-like vase affords evidence of an advance in craftsmanship without a corresponding growth of artistic perception.

British Museum



VAST NEOLITHIC REMAINS IN MALTA

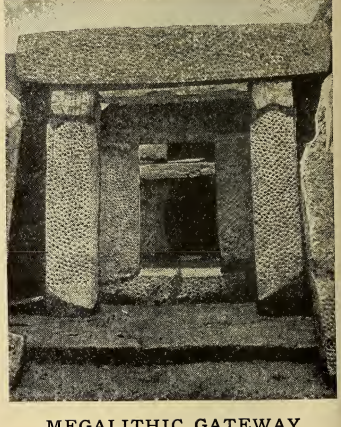
Once a temple—or temples if the 'wings' added to the original structure are to be regarded as entirely separate from it—the buildings at Hal-Tarxien are among the most impressive of Neolithic ruins in Malta. The apsed, elliptical chambers seen in this bird's-eye view are characteristic of such sanctuaries.

Courtesy of Professor T. Zammit

absolutely essential commodity during the Bronze Age.

Finally, we must say a few words about the early populations of the southern coast of the Mediterranean Sea and of the remains which they have left behind.

North Africa has yielded implements in abundance which are indistinguishable in character from those of the Lower and Middle Palaeolithic Periods of Europe. The Upper Palaeolithic of North Africa (the "Capsian" culture) is comparable with the Aurignacian or early Upper Palaeolithic of Europe, but with certain local differences. Neolithic implements also are abundant, and associated with the culture to which they belong there are remarkable rock carvings. These, for the greater part, represent animals, as do the paintings in the Palaeolithic caves of Europe; but, except in this one fact, the two arts are widely different. The cave paintings of Europe simply represent animals and nothing more; they are not shown in vigorous action. The African rock carvings show animals fighting, or carnivores devouring their prey. The African figures show species different from those normally represented in the European caves, and the art, as compared with that of the European Palaeolithic, is despicable.



MEGALITHIC GATEWAY

A pitted surface—either of stonework or pottery—was a decorative effect beloved by Neolithic Maltese architects and artists. On this temple gateway at Mnaidra the pitting was accomplished by means of flint drills; the rectangular frame within the trilithon was cut from a single slab of stone.

Courtesy of Professor T. Zammit

Megalithic monuments, dolmens and stone circles are fairly common in certain parts of northern Africa; these resemble in general character those of Europe, and doubtless are similar in purpose, and are the tangible expression of similar ideas. It is very noteworthy that the civilization of Egypt, for all its proximity, has had practically no influence

upon the civilization of the remainder of North Africa.

We have now briefly surveyed the whole of the Mediterranean basin, and may pause to take stock of what we have learned.

First, we see how complex has been the history of civilization. Round the sea, except on the east, there is a considerable measure of racial uniformity. We have found the Mediterranean race almost everywhere, and we can also pursue it far north, to Ireland, though that is another story. We find, too, that on the whole there is a climatic uniformity around the sea, and that while no doubt some regions are more fertile than others, or more mountainous, or more liberal in their yield of this commodity or that, yet, speaking generally, the conditions of life are much the same everywhere. Notwithstanding this, how diverse are the arts, as they were evolved in the different regions! Forms of pottery or of implements appear in one place that are unknown in another. Modes of sepulture likewise show many varieties. Certain communities early acquire the art of writing; others never attain thereto.

And secondly, we learn the importance of the little things of life to the student. Someone has said that "an inch of potsherd is worth the whole of Herodotus." This is a foolish exaggeration, but, nevertheless, an inch of potsherd, when set beside other inches of potsherd from other regions, may open to us pages of history as rich and as varied as anything that Herodotus has bequeathed to us. With the aid of just such seeming trifles we are gradually fitting together a great mosaic picture of the "prehistoric history" of the lands that border on the most wonderful sea in the world.

EUROPE IN THE AGES OF STONE AND BRONZE

THE BARBARIC HINTERLAND OF THE CIVILIZED EAST AND THE MEGALITHIC CULTURE THAT TOOK ROOT THERE

SIR BERTRAM WINDLE, D.Sc., LL.D., F.R.S.

Professor of Anthropology, Toronto University, 1919-1929; Author of 'The Prehistoric Age,' 'The Romans in Britain,' etc.

DURING a very lengthy period—when he was living in what is called the Stone Age, and for the greater part of this, the Old Stone or Palaeolithic Age—Man knew nothing of the use of metals. His mode of life was that of a nomad hunter and fisher; he had no settled home, no idea of agriculture, no flocks or herds. The era of the great early hunters came to an end with what is known as the Azilian period. Sollas and De Geer seem to be able to show that the probable date of that period was some 7,500 years ago. Everything before that in the way of dates is mere guesswork, and how uncertain the guesses are may be gathered from the fact that they extend, for the same epoch, from 50,000 to 350,000 years.

After the Azilian period we have a different form of culture to deal with—that of the New Stone or Neolithic Age. In it, while Man no doubt hunted and fished as he has done ever since, and ate of the roots and fruits which had been so important a part of his predecessor's bill of fare, he had learned to till the ground and raise crops of the improved descendants of various wild grasses such as wheat, oats and barley. Further, he, or more probably his wife, had succeeded in domesticating the young of the wild cattle of his district, so that he had flocks and herds as well as cultivated land.

All this entails a settled home, and home added to home, so that settlements grew up, and with them an early form of settled civilization impossible to men of nomadic life. But a settled life means that there is a danger in the attacks of those still living the nomadic life. Means have to be devised to repel such attacks, and so there arise rude fortifications, ring-fences of earth or stone or both with palisades. Of course, the chief objects after which this era is named are the polished and hafted axe-heads of stone that replaced the rudely flaked implements of the earlier era.

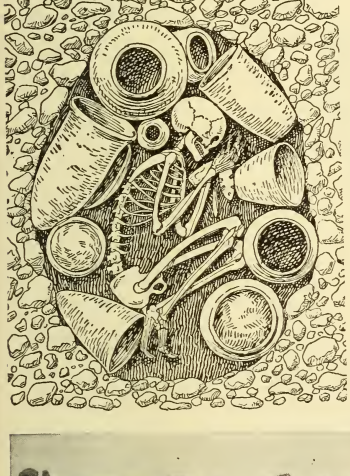
Moreover, Neolithic Man made stone adze-heads, with which he fashioned the dugout boats that he used where he lived in lake dwellings, and he made rude stone saws, so that he was something of a carpenter. Basket weaving he had learned, and from baskets lined with clay to keep water from running out of them he had evolved the art of handmade pottery. The wheel, however, was yet to be invented in the far distant future.

Furs, no doubt, he used, especially in northern regions, but he could spin and weave and dye. Some details of his dress we may learn from the Later Palaeolithic or transition cave pictures. The agriculturist must know the times and seasons, and as the man we are dealing with had no calendars to help him, it was only by the heavenly bodies that he could keep track of time as it sped on its way. So he became an astronomer and constructed observatories which were very possibly temples also.

Earlier races had been gifted with a wonderful natural artistic genius. The Neolithic Man with whom we are dealing was not remarkable for this quality; his mind ran on geometrical figures, which he reproduced in the adornment of his pottery.

Unquestionably, Neolithic Man believed in a future state; and the gifts that were placed beside a dead body when it was buried are so numerous—especially in the earlier part of the era—as to make

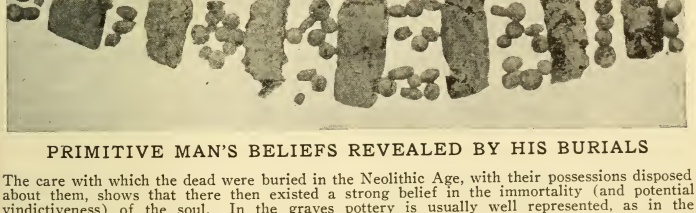
one think that, like the modern gipsies, he did not suppose it right to retain any of the portable property of the deceased man or woman. This property often included personal ornaments, shells and beads of amber once linked together as necklaces or bracelets. Sometimes amber is found in enormous quantities in jars in the interments, one of these weighing seventeen pounds and containing no fewer than four thousand articles. This is eloquent testimony to a firm faith in another world, which it would be supposed was not very different from this one; in it at least the departed soul decked itself in a very human fashion.



It affords equally strong evidence, however, of extensive trade, since the source of amber is the Baltic. The fact that goods were conveyed to and from different parts of the continent implies that there were trade routes, and traffic on these trade routes would mean that intercourse between distant populations had been established, and, therefore, that civilization was being extended and broadened.

A remarkable feature of this time was the construction of monuments of great stones, termed megaliths. As the whole matter is closely concerned with the disposal of the dead we may consider that question first of all. Inhumation, the burial of the entire body in a cave or in a hole in the earth, is the older method; it was only later that the practice of cremation was introduced. It is thought to have marked a change in religious opinion. Whether fire was regarded as a purificatory ceremony for the benefit of the soul, or as an effectual means of laying a possibly troublesome ghost, or neither, we cannot tell. Certain it is, however, that the two practices for a time co-existed side by side. Cremation is first found during the later part of the Neolithic Era, and was practically universal during the later part of the Bronze Age.

But in the earlier time the bodies were laid in stone tombs known as dolmens; these have the appearance of huge stone tables, the literal meaning of the name given to them. In their simplest form



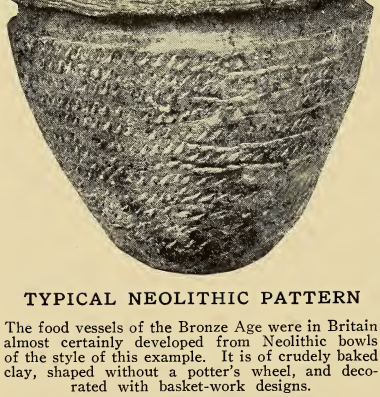
PRIMITIVE MAN'S BELIEFS REVEALED BY HIS BURIALS

The care with which the dead were buried in the Neolithic Age, with their possessions disposed about them, shows that there then existed a strong belief in the immortality (and potential vindictiveness) of the soul. In the graves pottery is usually well represented, as in the Neolithic Egyptian interment (top), and weapons are common. Almost as widespread and even more interesting are small ornaments of amber (below); they are generally pierced, having formed parts of necklaces.

From de Morgan, 'Prehistoric Man,' and British Museum

they consist of two or more stones fixed upright in the earth, on the top of which a third, often of great size, is laid flat so as to form a roof. The bodies were deposited within, and the whole covered by a mound of earth.

The dolmen's wide distribution must now be described. If we consider the southernmost group, we remark that the dolmen is to be found in the Sudan, Egypt, Tripoli, Tunis, Algeria and Morocco. Farther east, the dolmen occurs in India, Syria, Palestine, the Crimea, the Caucasus and Bulgaria. There are examples of dolmens elsewhere in Europe—in Spain, Portugal, France, Belgium, Holland,



TYPICAL NEOLITHIC PATTERN

The food vessels of the Bronze Age were in Britain almost certainly developed from Neolithic bowls of the style of this example. It is of crudely baked clay, shaped without a potter's wheel, and decorated with basket-work designs.
British Museum

North Germany, Denmark, Sweden, Norway, western England and Ireland. Let us notice the gaps: dolmens have not been discovered in south Germany, or in Hungary, or in Greece. These facts need explanation, and some people have suggested that there once lived a dolmen-building race.

However, such a supposition is not necessary, since a religious idea would account for the buildings, and religious ideas are capable of very rapid propagation. But again, do we need this explanation? The answer lies in our attitude to one of the most disputed questions of the day in ethnological circles. Can a cultural fact ever be independently invented in different places? Some argue that such a phenomenon never occurs; others that it does, but that re-invention is less frequent by far than diffusion.

It suffices to say, then, that, while the plan of the simple kind of erection described above is one which might easily have been conceived independently by men far apart from one another, it is clearly proven by the facts that there are regional gaps, though stone in those regions was not lacking for the building of dolmens. Above all, it can be shown that, in western Europe at any rate, the dolmens do cluster round those districts which produce copper, tin, amber and gold and were accessible to sea-borne traffic —all which suggests a common source whence the practice of dolmen-building diffused.

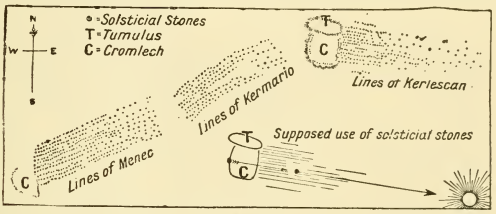
If so, where did the original conception originate? There is an important school that locates the beginnings of all ideas in Egypt, and to that school the dolmen is derived from the "mastaba" type of early Egyptian tomb. Thus what is now called the Heliolithic Theory, in which is included an answer to the dolmen question, teaches that from Egypt came the ideas which influenced not merely Europe but the East as far as China, and, beyond that via the Pacific Islands, Mexico and perhaps other parts of the New World.

Many think that this vast edifice of admittedly fascinating theory is built upon a very small foundation of ascertained fact, and believe that the dolmen was introduced to Egypt from Syria, or to both from some third undetermined spot. Yet another view is that the dolmen originated in the Iberian peninsula, in the basin of the Tagus, and thence spread through Europe, being derived from cave tombs; it is suggested, indeed, that both dolmens and cave tombs were merely modifications of the rock-cut tombs of southern Sicily.

From the dolmen we must turn to the consideration of other forms of megalithic monuments. The simplest and most widespread is the menhir, or standing stone. Strictly speaking, a single line of these megalithic standing stones is known as an

alinement; many of these are to be seen in south-western England. Dual, triple or multiple rows of such stones are often loosely called by that name by writers of today, but the word "avenues" is better, since it distinguishes them from the single row. Both the single and the multiple stones are sometimes of an immense size. The giant specimen at Locmariaquer in Brittany, for instance, has been in four separate pieces since its fall, but it was sixty-seven feet high in the days of its greatness.

Within Brittany the greatest avenues are also to be found. At Carnac there are three groups—the lines of Menec, which consist of eleven rows of menhirs, each from three to thirteen feet in height, making a total of 1,169 stones; those of Kermario, ten in number, and comprising 982 menhirs; and the thirteen lines of Kerlescan, which consist of 540 stones with a circle at the western termination. At Erdeven, another site, there are 1,129 stones in thirteen rows extending for one and a quarter miles. Professor Déchelette has stated that these are the only true alinements in existence, but there is no reason to deny that title to the examples of Wilts and Devon.



SIGNIFICANCE OF MEGALITHIC AVENUES

Of the three huge avenues of standing stones at Carnac, in Brittany, one, as shown in this plan, faces the east, and two the north-east: that is to say, they point towards sunrise respectively on Midsummer Day and on the two equinoxes, clearly proving their builders' preoccupation with the sun.

The Carnac group have a connection with the sun, for two of them face north-east, and the third east—that is, towards sunrise and the sun at the solstices. But this matter of the astronomical importance of such early monuments may be more suitably dealt with in connection with the next form of megalith, the stone circle. Sometimes called cromlechs, these erections are in fact circles of stones, and there is no reason why we should not simply refer to them as such. The circles vary in diameter (one hundred feet is not an uncommon measurement), and are formed of standing stones of varying height—very often they are quite small. In many cases in Great Britain and elsewhere the circle is connected with one or two avenues. The largest example of this kind of monument is the collection of stones at Avebury in Wiltshire.

"Avebury doth as much surpass Stonehenge as a cathedral doth a parish church," said John Aubrey, that genial recorder of the lore of the late seventeenth century. A certain Farmer Green of evil memory, however, removed many of the stones, and the circle is now sadly reduced, though still a thing to inspire wonder. In the first place it covers twenty-eight and a half acres, and within the ditch that surrounds it is a little village with church and manor house. The rampart and fosse form a circle 1,400 feet in diameter; and, as the ditch is inside the bank, the erection cannot have been of a military character.

Even today the ditch is forty feet deep. There are two avenues, from which, however, the standing stones have been freely removed. Within the ditch there was originally a wide circle; and within this double ambit were two circles, each double and concentric, and each containing in its center what has been called a "cove"—some arrangement of stones, perhaps taking the form of a dolmen.

Far more widely known than the Avebury stones is Stonehenge, an erection of later Neolithic times, situated some two miles west of Amesbury on Salisbury Plain in Wiltshire. It has a ditch and a rampart, which is quite low in comparison with that at Avebury and encloses an area only 300 feet in diameter. Within this was once a circle of stones, of which none remain, though the holes which they occupied have been discovered—they are known as "Aubrey holes," from Aubrey, who mentioned them and thus caused

SORRY REMAINS OF AVEBURY'S PAST MAGNIFICENCE

Consisting originally of a wide circle containing two smaller, double rings of stones, the Avebury works were surrounded by a rampart and ditch, and were approached by two avenues lined with menhirs. Surviving menhirs, once part of the outer circle and the southern inner circle testify to the megalith builders' engineering skill.

search to be made for them. From the north-east side an avenue, now devoid of stones and merely a double embankment, passes out; in the middle of it is a menhir known as the "Friar's Heel." Within the ambit of the Aubrey holes is a circle of shaped pillars with imposts.

This last-named feature is absolutely unique, for there is no other circle which has such imposts, nor is there any other in which the stones have been shaped. Further, the lintels are held in position on the uprights by a mortise and tenon joint, also an individual characteristic of the ring at Stonehenge, and one that shows a knowledge of carpentry. Within this is a circle of much smaller stones, unhewn and without imposts, but they are in some ways the most interesting feature of the group.

Unlike nearly all the other stones, which are "sarsens" of the kind found scattered all over Salisbury Plain, these stones are foreign, and there has been much controversy as to the place of their origin. Opinion to-day considers the Prescelly Hills in Pembrokeshire, just above Fishguard, 180 miles to the west of Stonehenge, to be the place. Nobody can say why they were brought from this great distance. They may have been the stones of some sacred edifice removed by emigrants, or trophies of war.

Within them, again, were five great "trilithons," only two of which are standing today. Each of these is like a detached segment of the ring of pillars and imposts, but is of much greater size. They formed a horseshoe; within it was a second horseshoe of foreign stones, and within that again there is a flat stone lying on the ground known as the Altar Stone. This, the only other foreign stone in the group, may have come from Somerset. When the sun rises on Midsummer Day, its rays, if visible, stream over the Friar's Heel, across the Altar Stone and through the aperture of the great central trilithon of the five. That such an arrangement should be regarded as accidental would be to stretch the long arm of coincidence altogether too far.

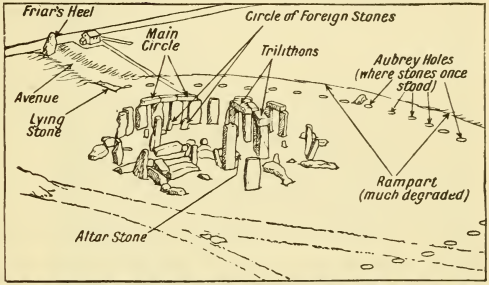
Controversy continues to rage over the solar nature of the stone circles, some flatly refusing to believe in it, but the evidence seems conclusive. The people who erected these circles were agriculturists; it was of great importance to them that they should be able to mark the passage of the seasons, and they had no clocks and no calendars. Those are the basal facts. The theory suggests that circles like Stonehenge and others were solar—or in some cases stellar—observatories, by means of which the flight of time could be observed and the farmer made aware when his spring operations should commence.

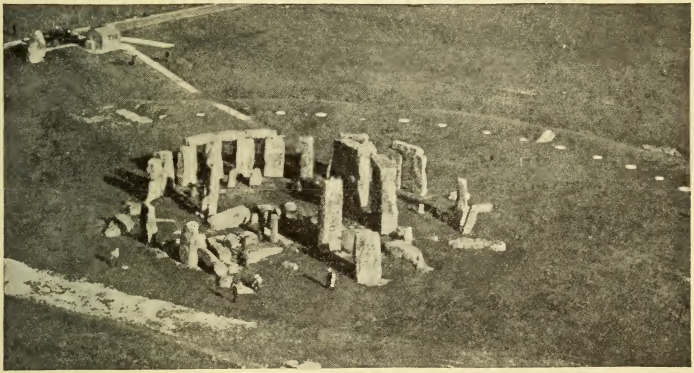
Of course, the exact point of rising of the sun shifts very slightly from year to

year, and from calculations based on that fact Sir Norman Lockyer estimated that Stonehenge was erected about 1800 B.C. Professor Gowland, when examining the circle at the restoration of the stone which fell on the night of December 31, 1900, came upon evidences of copper which led him to think that the monument was of the very end of the Neolithic Period just as it merged into the Chalcolithic, or the age when stone and copper were in simultaneous use. At any rate, its character entitles us to believe that it was the latest of all these monuments. Like the megalithic remains in Brittany it was obviously a holy place, if we may judge from the number of interments around. To conclude this matter, the great engineering skill necessary for the erection of all these monuments must be noted.

It is now time to turn from their relics to the races of the period which we are considering, and a study of them must be prefaced by some remarks on that thorny problem, the peopling of Europe. Where the earliest people came from we do not know. It is supposed, however, that towards the end of the Palaeolithic Age a considerable part, at any rate, of western Europe was inhabited by the Magdalenian race, which had come into Europe from the steppe regions, with a fully developed art of its own, and spread down to the Pyrenees.

In North Africa there seems to have been a race called the Capsian, which around 7000-6500 B.C. immigrated into





THE REMAINS OF STONEHENGE SEEN FROM THE AIR

Although the great structure has suffered considerably with the passage of years, enough remains to enable us to realize the pristine grandeur of Stonehenge, England's most ancient monument. The surrounding earthwork, which has a diameter of about three hundred feet, is clearly perceptible; the white marks within it indicate the points at which the foundations of an outermost ring of standing stones have been discovered, though the stones themselves have disappeared. The key diagram above distinguishes the component parts.

Photo, Central Aerophoto Co., Ltd.

Spain and advanced northwards, eventually pushing the Magdalenians out of its way and reaching Britain about 5000 B.C. These Capsians seem to have belonged to the great Mediterranean race. One thousand years later—pray remember that all these dates are exceedingly tentative—the Alpines, so called from having been first recognized in Alpine districts, began to seep into Europe from the east. Before dealing with them, however, it will be necessary to glance at the physical geography of the continent.

FOUNDATIONS OF TIMBER FOR A BRITISH LAKE-DWELLING

These remains of a lake-village at Glastonbury, though dating from the Early Iron Age, show the methods used in constructing such dwellings. When the site was first occupied it was covered by a shallow mere, having a peat bottom which afforded an insufficient basis upon which to build. A structure of logs and heavy timber was accordingly laid down; it has an average thickness of three feet, being bounded on two sides by a neat palisade, part of which is seen in this photograph.

From A. Bulleid, 'The Glastonbury Lake Village

First, we must draw attention to the vast northern plain extending from the North Sea to the Altai mountains near Mongolia, broken only by the Urals, and then not seriously, for their altitude is not great. In the south we have another great plain terminated at its southernmost edge by the Sahara; and here, logically, Europe may be said to end, since the Mediterranean is only an incidental lake, and not so long ago was two lakes with land bridges at Gibraltar and Sicily. This southern plain extends from Morocco to Mesopotamia. Between these plains is a mountainous core or highland zone, running from the north-east to the south-west. It has its beginning in the east, in those highlands of Armenia that are connected with the North Persian mountains, and works across Europe to terminate at the Pyrenees, being for the greater part of its length an upland, moist, forested district.

At the eastern end of this region we find people of the Armenoid or Anatolian race. They have extraordinary flat-backed heads, so extraordinary that it was once imagined that the deformity—if such it may be called—was artificial. These heads, like those of the Alpines, are of the broad type.

No observant person looking down on the heads of a crowd from a gallery in a theater or elsewhere can fail to note that some are long and narrow, some much more nearly approaching the circular. Anthropologists call these respectively dolichocephalic and brachycephalic skulls, but let us be content to call them long and broad. So far as we know, the majority of the peoples existing in Europe up to the time with which we are now dealing were all of the long-headed type.

However, we have now a broad-headed race making its appearance. It may have had its cradle in the plateau surrounded by the mountains of Asia Minor that lies immediately west of the Armenian mountains. Neolithic implements are common in this district, and these peoples came into Europe, it is thought, about the time of transition between the Old and the New Stone Ages.

The main current of Alpo-Carpathian

newcomers was related to the peoples of the mountains and plateaus that stretch from the Himalayas westward. It made its way to the Balkans and along the mountain zone we have been considering. The principal eastern groups of these people are known today as Slavs; to the west are the "Cevenoles" or "Auvergnats" with the broadest heads in France, living in the Ardennes, in the Vosges and in the central plateaus of France in scattered communities. The Illyrio-Anatolian group comprises the Armenians—with whom the Hittites were connected—and the Illyrians or Dinarics of the Adriatic, a variety of the above.

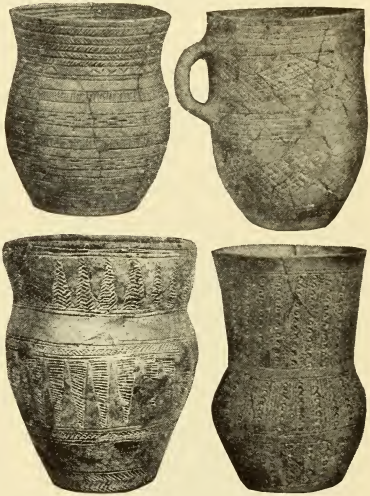
Many of the broad-heads made their way into the mountains of Switzerland, and there developed a mode of life worthy of study. For the settlers felled the trees of the forests which fringed the lakes, and, having driven the trunks into the shallow waters as piles, built platforms on which they set their huts. Thus the lake-villages, of which so many remains have been found, were formed. Farming operations were carried out on the patches of land along the lake-sides; the cattle were driven up to the alpine pastures in summer as they are today; but the families, and in time of stress the cattle too, were able to enjoy comparative safety from enemies and from the wild beasts of the woods on their artificial islands, since dug-out boats and easily removable causeways of planks were the only means of access to them.

Of course, the limit of possible population of such places was reached before very long, and there was a certain amount of emigration. Some of these people, for instance, eventually worked their way south into what is now Italy. Here they had left the lake-region but were still on swampy land; and they perpetuated their old method of life, erecting a modified kind of pile-dwelling known as a terramara, in the Po valley and as far south as Bologna.

But lake-villages were by no means an exclusive discovery of the Alpines of the Swiss lakes, for there are ancient descriptions of similar communities in northern Syria and in Georgia. Herodotus, who describes such villages in Macedonia in the fifth century B.C., mentions that the inhabitants fed their horses on fish.

Similar lake-villages occur in distant parts, in the British Isles for example, where there were places such as the village at Meare, near Glastonbury, which existed at least down to the third century A.D. Other such villages are to be found in the peat mosses of Scotland, but perhaps one of the most interesting groups of similar communities is that of the crannogs of Ireland, which were inhabited, even used as fortresses, as late as the time of Queen Elizabeth.

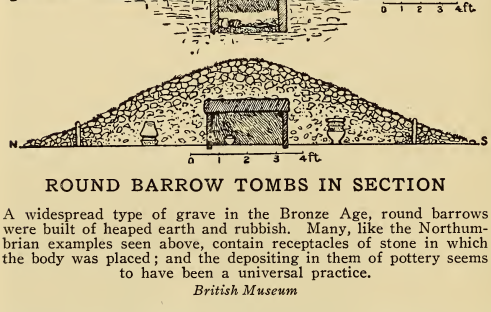
Now, the idea that inspired the building of these is the same as that evolved by the builders of the Swiss lake-dwellings; the same, indeed, as was held by the architects responsible for the moated castles and houses and even farms of much later days: "Live on an island, and if you cannot find an island, make one." Obviously



WARE OF THE 'BEAKER' FOLK

Signs of a new culture, beakers such as these are found in graves throughout the greater part of Europe. They seem to have served as food-vessels and are wide-mouthed, of thin, tough ware usually ornamented with geometric designs.
British Museum

that can be done either by putting a ring of water round a given piece of land, or by taking your land and setting it in a piece of water. The Normans did the former, the Irish the latter. They drove piles into comparatively solid ground beneath shallow waters, so as to form a circle, and into this they dumped stones and earth and intersecting trunks of trees, making a solid platform, not a raised one, as in the Swiss lake-village. Such was the type of the Glastonbury village and of scores of Irish crannogs. Of course, such artificial islets tended gradually to sink, but that could be rectified by additions of earth. We know, from the superimposed hearths, that this was done on many occasions in the Glastonbury village.



ROUND BARROW TOMBS IN SECTION

A widespread type of grave in the Bronze Age, round barrows were built of heaped earth and rubbish. Many, like the Northumbrian examples seen above, contain receptacles of stone in which the body was placed; and the depositing in them of pottery seems to have been a universal practice.

British Museum

There were, at least associated with this Alpine race, some other groups of whom mention must now be made; and first of all of what are now called the Beaker folk. Suddenly, it would appear, there arose in Spain a people skilled in making a form of pottery coeval with the megalithic industry, but late in this era; the impulse to make it seems to have come from some new stimulus, which was, perhaps, North African. The bell-beaker was a kind of wide-mouthed vessel, ornamented usually with geometrical devices, and was made and used by a people who seem to have highly developed the art of archery and who overran the Iberian peninsula to the Mediterranean area and even as far as Sardinia and Sicily. Moreover, they crossed the Pyrenees and covered almost the whole of France as far north as Brittany. To England also they passed, and to the region beyond the Netherlands.

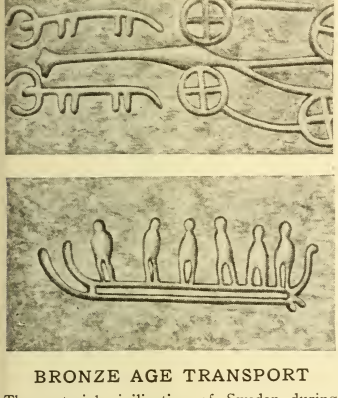
Nor was this a mere case of traffic in a special type of vessel, for the beakers are made in different areas of the local clay; it was the sign of an invasion (or invasions) of peoples bringing with them their own idea as to the kind of vessel that should be made. In the Swiss district the old lake-village civilizations resisted their onslaught, and they turned into Bohemia and Moravia. From this region now emerged a new type, associated certainly with the last and in the main following the same industries; it is even held by some writers to be identical.

Like the Beaker folk, these men were broad-headed and high-headed too, and had heavy brows. They buried their dead in cists of stone, which they covered with mounds of earth. The Neolithic people of Britain had done this too, but their mounds were oval, often ringed with standing stones. The barrows of the newcomers were round, not long, and hence the men who made them came to be called the "Round Barrow Race." They became too numerous for their place of origin in Bohemia and moved perhaps eastward at first, but mostly to the north-west, to Denmark and Scandinavia, marking their progress by their barrows. Covering the countries they passed through, they reached the sea at the Elbe, Weser and Rhine, and crossed it to Britain on its eastern coasts from Forth to Thames, expelling the "long barrow" folk to the central forests, but letting alone the more civilized megalith builders of the south.

They are, thinks Myres, "the ancestors of the John Bull type of Englishman and the kindred continental stocks." They had narrower heads than the true Alpines; they were taller and more robust and their occiputs were not flattened. Perhaps they

were a cross between the true Alpines and the Nordics.

A word must now be said about these Nordics. They seem to have come from the Russian steppes, and were horsemen and cattle drivers. They had long heads,



BRONZE AGE TRANSPORT

The material civilization of Sweden during this period is admirably illustrated in rock carvings in Bohuslan. Here we see an elaborate, four-wheeled chariot and a beaked ship similar in general plan to those later used by the Vikings.

From Montelius, 'Les Temps Prehistoriques en Suède'

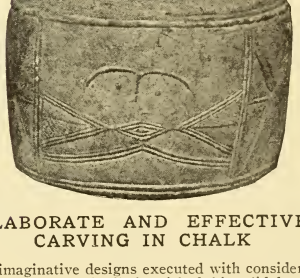
fair hair and blue eyes—in contrast to the brunette Alpines. Largely for political reasons we have heard a good deal about these Nordics. In fact, the effort has been made in some quarters to show that the Nordic is the only race of real excellence. This is pure nonsense, and due to the fact, as Peake says, that the Nordic "is strong, robust and courageous, and possesses certain manly qualities which are much admired; also he has taken care for some thousands of years to impress upon his neighbors that these are admirable qualities."

These people lived in the northern plain, in the district of the Dnieper, south of Kiev. The Round Barrow folk, if they be not the same people as the Beaker folk, are believed to have been crosses between these Nordics and the Beaker folk.

Reference should also be made to the people called "Prospectors" by Professor Fleure and "Maritime Armenoids" by Sir Grafton Elliot Smith. They belong to the broad-headed group, like the preceding races, and are believed to have been an early cross between the Mediterraneans and the Anatolians. Their distribution along the coasts of south-western Europe curiously coincides with that of the ancient mines of gold, tin and copper, and, therefore, of some types of megaliths.

Such was the racial mixture in Europe at the dawn of the Age of Metals. Now, though gold was the first to be used, if only for ornaments and in small quantities, it is to the discovery of copper that the real advance was due. Where, when, and how it was discovered are all much-disputed points. The Egyptian school believes that it was discovered in that land by the accidental fusion of some malachite paint used by the ladies of the period for adorning their countenances. Others think that it was the result of the fusion of a vein of the metal by some hunter's fire. It seems probable, that the knowledge of the metal had existed in Asia at least as early as 4500 B.C., and perhaps even five hundred years earlier; that it was there that the discovery was made; that it was brought from Asia to Egypt in about 4200 B.C.; but that it did not reach Europe perhaps until many centuries after that.

For a time copper was used unalloyed,



ELABORATE AND EFFECTIVE CARVING IN CHALK

Unimaginative designs executed with considerable technical skill distinguished this solid drum of chalk, found in Yorkshire, thought to have been an idol or fetish of the Early Bronze Age. On the drum is a stylized representation of a human face.

British Museum

though there is no evidence for anything like a universal Copper Age. It was too soft to be used for much except ornamental purposes, but weapons were nevertheless cast from it. Stone was still the staple, and the period in which both were used is called the Chalcolithic Era. There are evidences of such an era in Spain and in Ireland—perhaps elsewhere. But cassiterite, a salt of tin, occurs in some instances with copper, and it was found that a mixture of the two made a hard metal really useful for implements and weapons. Gradually the classical blend of ten per cent of tin became the standard bronze. This was the real start of the Metal Age.

Where the discovery was first made is unknown. Sayce found, in the celebrated royal library of Ashur, an inscription of the reign of Sargon of Agade, c. 2800 B.C., in which the "tin-land . . . beyond the upper sea," i.e. the Mediterranean, is mentioned. People were interested in tin, then, at that period; and it is difficult to see why, save for the making of bronze. The earliest bit of bronze in existence is said to be one found at Medum in Egypt and dated to 3000 B.C., though it may be 1,000 years later. There is a claim made that it was known in China as early as 4000 B.C., but the existing evidence is not convincing. It was found in the second city of Hissarlik, where it would be made not later than 2000 B.C. In Crete it was known earlier even than in Egypt, since it had already appeared during the Early Minoan series of civilizations.

Wherever it was discovered, it spread all over Europe, and with it came a higher culture, for the plough drawn by cattle superseded the earlier hoe, as we see from rock carvings of the period. Men also built boats instead of dug-outs, and, judging from the carvings in Bohuslan in Sweden, these were capable of accommodating as many as thirty people. Salt was mined, as at Hallstatt in the Salzkammergut, where later there arose during the Early Iron Age a great culture known as the Hallstattian. This late bronze culture, with its remarkable art, belongs to the next great epoch, that of iron, which, in its later development of steel, is that in which we ourselves are living.

Thus from rude stone implements, through those of superior character, polished and hafted, we arrive at the use of metal which transformed civilization, made its spread enormously more rapid, and for better or worse created the environment in which we exist today.

THE GODS OF THE TWILIGHT

MAN'S EARLY EFFORTS TOWARDS AN EMBODIMENT OF HIS SPIRITUAL NEEDS IN A PERSONAL RELIGION

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OUR evidence for ancient religion reaches back a very long way. Of course, we do not get back to the beginnings, and such evidence as we have is incomplete and one-sided; but some 5,000 years ago religion was already well organized, and had characteristic features which may be said to foreshadow more advanced developments, even as lower organisms resemble those at a higher stage of evolution.

Our oldest direct evidence comes from Egypt and Babylonia, lands which owed both their prosperity and the nature of their religion to the fact that they consisted of a number of separate towns and city states, which depended upon the organization of the water supply. This economic co-operation, without which life would have been impossible, encouraged the growth of civilization, and the religions of the two lands had much in common.

In contrast to the marked religious uniformity of Egypt and Babylonia, the old Greek world, with its differences in climate, soil, language and civilization, was distinguished by a no less marked variety and originality. Again, the religion of the Aryans (in the poems of the Rig-Veda) and that of Iran or Persia (in the Avesta) were once most intimately connected, but they quickly diverged owing to differences of land, climate and racial temperament.

SUPREME IN EGYPT

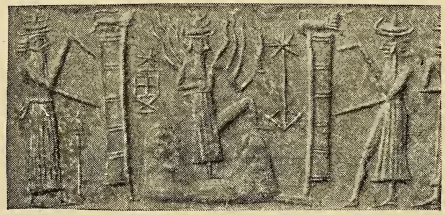
Originally the local deity at Thebes, Amen was eventually identified with the sun-god, Ra; and as Amen-Ra was sovereign in the land of Egypt.

Photo, Mansell

Finally, the Semitic temperament differed from that of the Indian on the one side and that of the Egyptian and Greek on the other; and while the three great historic religions—Judaism, Christianity and Islam—are of Semitic origin it is only the second of these that has been shaped by Indo-European genius, and no doubt on that account has spread through the western world.

One is almost overwhelmed at first by a vast medley of gods, spirits, demons and the rest which abound in the world of religion. But what is fundamental throughout is the prevalence of group, local or regional religion. Of this ancient Egypt and Babylonia furnish most instructive examples. Each district (or "nome" in Egypt) was properly a separate social, political and religious unit, with its own chief and its own presiding local deity. Between god, ruler and city or land there was the closest triangular relation-

ship; for the god, like the chief, was felt to be more closely related to his own city or land than to any other, and the people expected more from these



DEIFICATION OF THE SUN

Among Nature gods the sun has usually been accorded a high position. On this Babylonian seal we have a religious conception of dawn: the sun-god is represented stepping through the gates of Heaven which are being held open by attendant deities.

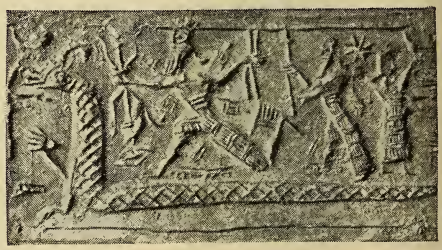
British Museum

two than from the gods and chiefs of other districts. For a man to leave his district was to lose the protection of his own god, and a new religion was necessary if he wished to live at peace in a district not his own.

How each district recognized the existence and authority of neighboring gods is very clearly shown in Chapter xi of the Book of Judges, when Jephthah recognizes that the Moabite god Chemosh helped Moab as his own god Yahweh helped Israel. When districts were closely allied there was a tendency to perceive that the local gods, however different they might appear on first encounter, were in some way alike, if not akin; and in this way all sorts of interesting developments in religious combination arose.

Should there be war, on the other hand, not only was the army the god's army, but the gods were supposed to participate. The enemies of a district were the enemies of the god, accursed by him; and the gods would go forth to war, often in the shape of images or symbols, so that the loss of these precious objects was tantamount to defeat. The tributaries of a city became the tributaries of the city god, and when treaties were made the gods once more played a part.

A league of peoples or nations would be bound together primarily by the common religious beliefs to which each of them adhered. The gods gave victory and received thank-offerings. Defeat could be ascribed to the superiority of the enemy's gods or to the anger of one's own, and in the latter case steps might be taken to determine the cause and propitiate



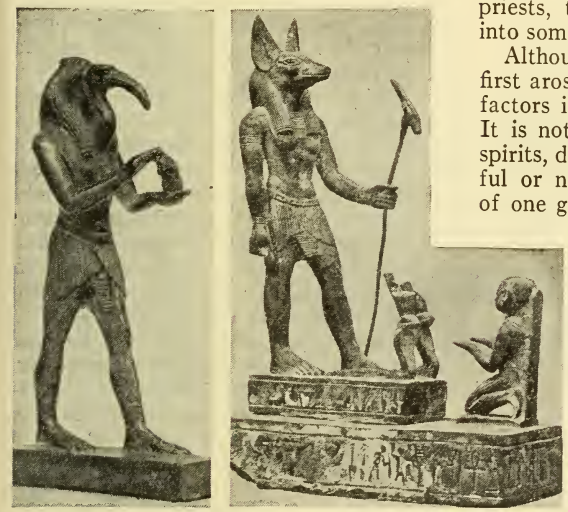
GODS OF ANCIENT MESOPOTAMIA

Each city state of Mesopotamia had its deity; war was waged in his name, and success glorified him. Above are two such parochial gods who achieved widespread recognition through the prowess of their worshippers: Marduk of Babylon (upper picture) slaying the monster Tiâmat; and Shamash of Sippar (below).

British Museum

him. But when through any reason a god acquired a great reputation, pilgrimages would be made to him, rulers and priests would spread his name. Equally, the supremacy of ruler and city meant the supremacy of the god.

Certain cities gained prestige in this way, and local gods were widely recognized, like Amen of Thebes, Shamash of Sippar or Marduk of Babylon. Neither a supreme chief nor a supreme god could tolerate rivals, and many interesting developments ensued; for example, local chiefs and gods would acknowledge the suzerainty of the supreme ruler and god, and in this way the religion became "centralized."



DEVELOPMENT OF ANIMAL WORSHIP

However idealized their natures latterly became, the theriomorphic deities of Egypt were originally the objects of animal worship, perhaps totems. Thus Thoth (left), measurer of celestial seasons, was primarily the divine ibis; and Anubis, god of the twilight, the divine jackal.

Left, British Museum; right, Cairo Museum

It is easy to realize how great would be the difference between a purely local god, one whose habitation and sphere of work were restricted, and a god who was in some way subordinated to a great national deity or was merely a local form of him. Nature gods, for instance, gods of moon, sun, sky and rain, were visible and accessible to all, and, therefore, were such as could unite the cults of peoples spread over a large area. Moreover unity could also be obtained by definite doctrines concerning the interrelation of the local gods. Hence the history of early political development, the extension of power far beyond the immediate neighborhood of the city state, is also the history of religious development.

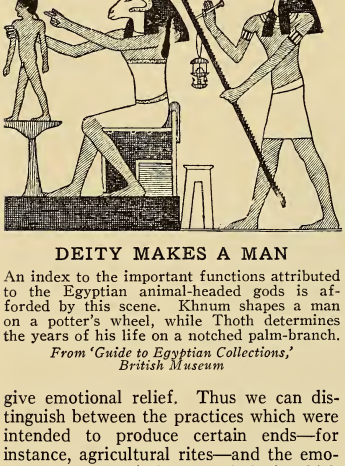
Now, at the point where our earliest clear evidence begins all these centrifugal and centripetal tendencies were at work. Many local gods were becoming widely known, there was overlapping of sphere and function, and efforts were in due course being made, particularly by the priests, to reduce the medley of deities into some sort of order.

Although we do not know how the gods first arose in the minds of men, the main factors in their history can be discerned. It is not enough for us to classify gods, spirits, demons and so on into good, harmful or neutral, for the beneficent spirits of one group may be the dangerous ones of another. What is far more fundamental is, first, the very common experience that men have of what is abnormal, marvellous, mysterious and uncanny, especially when they are taken out of themselves or away from ordinary life and experience.

All the more intense states, and even states induced by dancing, liquor or orgiastic rites, have been commonly interpreted as experiences of a supersensuous existence, and especially, in certain types of cases, as experiences of the presence or nearness of the gods. That is to say, feeling, emotion and personal experience are the springs of religion, although it is important to note that such religion is not necessarily in itself of any high spiritual, social or intellectual value. On the other hand, it is a very common tendency to attribute to supersensuous agency all that is especially striking: primarily, what is inexplicable, irregular and unexpected, and, later, what is impressive by reason of its regularity and evident permanence. That is to say, either what causes awe, fear or speculation by being unaccountable, or what causes profounder feelings as the manifestation of some dependable

process or agency, serves to evoke, each one in its turn, a belief in superhuman agencies.

Though religious and social systems are so closely united that the religious or mystical elements seem to preponderate in the life of ancient peoples, there is much, even among rudimentary peoples today, that is performed in a purely "common-sense" or "secular" way. But religion enters especially into the difficult or critical occasions of life, to ensure success, to ward off danger or to



DEITY MAKES A MAN

An index to the important functions attributed to the Egyptian animal-headed gods is afforded by this scene. Khnum shapes a man on a potter's wheel, while Thoth determines the years of his life on a notched palm-branch.

From 'Guide to Egyptian Collections,' British Museum

give emotional relief. Thus we can distinguish between the practices which were intended to produce certain ends—for instance, agricultural rites—and the emotional attitude (faith, conviction) which supported men even in case of disappointment or failure, such as lack of rain or loss of crops.

But we have also to notice those practices which we should consider irrelevant or impossible—for example, those believed to bring rain—and must distinguish between those which for their real emotional and social value may be called "magico-religious," and could have a certain psychological value, and those which were purely magical and whose efficacy appears to lie in the mere ceremony itself. So, too, there were practices to persuade the gods to grant requests; but while some had a distinctly emotional or social value, others were too mechanical for us to consider them of any religious significance.

Hence, quite apart from the ultimate problem of what a Supreme Power in the universe does for Man, we may say that progress in religion has been due to two factors: experiences that were emotionally valuable for the individual as a member of his group, and ideas which ultimately led to the growth of positive knowledge bridging the gap between primitive prehistoric Man and civilized Man of the present day.

Now, while the belief in the existence of a spirit world is due partly to certain experiences and partly to the desire to find causes and explanations, there existed, as distinct from the gods who were merely gods of *causation* (givers of rain, growth, victory, etc.), a belief in those who—like local gods or deified ancestors—stood in close personal relationship with men. Indeed, if it were not for the desire to explain things, and for the actual *personal* experience of some supersensuous power, religion would be an absolutely incomprehensible phenomenon instead of one readily understood.

Gods of the second of these two classes were "personal" gods, whether they were, as in some cases, deified men, or whether, as in early Egypt, they had animal forms like the ibis Thoth, the jackal Anubis and the ram Khnum. Gods in animal form ("theriomorphism") were supposed to feel and to act more or less like human beings ("anthropopathism"); and, although gods in human form ("anthropomorphism") were more usual, animal symbolism was common in Egypt and Babylon, the bull with its strength and virility being especially familiar in the ancient Near East. In impassioned language the god *was* a bull; the lion and ewe were also similarly used as symbols in Babylonia. Just as with us the lamb, dove, fox and serpent furnish appropriate images of innocence, cunning and so forth, so in ancient religion theriomorphic rather than anthropomorphic imagery was often employed to furnish an adequate symbol for godhead.

Even at relatively high stages of civilization ideas of deity are often felt to be too imperfectly expressed in terms of human personality, while, at the lowest stages, the knowledge of personality is so slight and the theriomorphism so complete that the stage of anthropopathism can hardly be said to be reached. This, for example, seems to have been the case in primitive Egypt; and it is very noteworthy that even in the Greek age, in the days of the decline of this ancient semi-African civilization, animal cults were prominent.

The general movement in religion has been by no means a continuous one. It has consisted in the increasing knowledge of human nature, and this has come through individuals who by their character and activities have left their mark upon the contemporary religion. Looking back, we see Man learning to know his nature, his possibilities and his limitations. In his dreams he visited remote places and saw the distant or the dead. He sought to distinguish between the waking individual and what, to judge from dreams, trances, illness and death, was something evidently independent of death and dissolution.

Such were the rude beginnings of psychology.

Needless to say, it is very difficult to understand at all clearly the psychology of early peoples, the more especially as, where deeper experiences are concerned, we are often as much at a loss as they. Scantiness of positive knowledge prevented them from controlling their fancies and imaginations, and distinguishing between what could be called "real" and the opposite. And such knowledge as they had was often so much a part of their religion that any attempt to correct and improve upon it was apt to be resented as an attack upon the religious system. Persistent intelligent curiosity for its own sake was rare, and confined to the most practical matters.

From the known the unknown was explained. To the Egyptian the sky might be a huge cow with stars suspended from her. Why not? The sun-god crossed the sky in a Nile boat, a mode of transit as natural in Egypt as the chariot of the sun elsewhere. The flying falcon or the dung-beetle (scarabaeus) rolling its ball of dung suggested the sun in its course. But it would be truer to say that in the minds of those early worshippers these were not *analogies* but *identities*. The beginning of things was due to a potter-god, an egg or the act of sexual generation.

FROM SYMBOL INTO GOD

Since the ancients could not adequately express certain abstractions, they were accustomed to realize them in animal form; thus, a bull first symbolized superhuman strength and virility, then became a deity with these attributes. Here we see the Egyptian bull Apis being worshipped by a Pharaoh.

Photo, W. F. Mansell

Human and animal growth were not so much analogous as one and the same; and the fructification of the earth found typical expression in the marriage of the Sumerian Ninurta and Bau, the solar deity and the mother goddess.

In agricultural communities the supreme importance of sun and rain gods is manifest; and here fresh questions arise. When the "processes of Nature"—as we should call them—were performed or controlled by gods, everything obviously depended upon the activity of these divine causes or sources of life and growth. So essentially might a god be the origin, essence or cause of natural processes that in Babylonia, when the youthful god Tammuz slumbered the flocks slept, when he departed they brought forth no more; and

when the great mother goddess Ishtar (the same name as Astarte, Ashtoreth) descended into the lower world to seek Tammuz all procreation and fertility came to an end.

Men must appeal when in want to such powerful deities as these, and it is often difficult to determine whether they are to be regarded as processes—impersonal forces—which became personified, or as personal powers who were thought to be able to control the processes. In the second case we get a new line of speculation, when such gods have the assistance of subordinates, who carry out their orders and perform the necessary labors.

Specially interesting are such ideas as the creation of the world and the control

EA THE CREATOR

It was believed by the ancient peoples of Mesopotamia that creation depended upon the bidding of deities. Creative power was attributed, for example, to Ea (above), god of the deep waters and ultimate source of all human knowledge.

From De Sarzec 'Découvertes en Chaldée'

of vegetation by the "word" of the god Enlil. Another Babylonian god, Ea, conspicuous for his love of Mankind, to whom he imparted all knowledge, similarly uttered his creative "word." According to the priestly theology of Memphis, all things were first in the mind of the creator Ptah before he made them. It will be observed that in the growth of self-knowledge it was gradually being realized how much is due to forethought and will. It was a great step when men perceived how reason facilitated action; and from such simple beginnings was ultimately developed the sublime "Logos" doctrine which we find in the Fourth Gospel.

But men themselves, even primitive men today, not only appeal to the appropriate god for a particular purpose, such as rain or sun, or to a god who either has supreme power or who is expected to intercede on Man's behalf; they frequently act as though the natural processes virtually lay in their own power. Everywhere we find early men performing ceremonies supposed to control and utilize the processes of Nature. It is as though they were gods! And, whatever we may think of their beliefs and practices, the fact remains that thereby they acquired an incalculable amount of knowledge which would not have been gained otherwise. They learnt to observe how things were done, the elementary facts of Nature, the habits of animals and birds, and so on.

Also, there have always been men who, for some reason or other, have been regarded as especially effective with the gods; indeed, extraordinary powers have been ascribed to them in their own right. Men of conspicuous personality, or who attracted attention by unusual success, readily gained renown. Now, while the gods often came to be regarded as exceptional human beings, though of another sphere, such men were, in a sense, more divine than human, and by reason of their presence and accessibility could be regarded as more influential and authoritative than the unseen spiritual beings themselves.

Here, again, there are manifold developments. Such men were readily chosen as leaders, and their function became hereditary. Or they became priests whose authority lay essentially in their ability to influence the unseen world. In this way rival authorities emerged, and either rulers—"priestly kings"—sought to control the power of the priests, or priests, as happened during the decline of Egypt in the Twentieth Dynasty, became kings. And besides these there were the more isolated individuals, the magicians appealed to by private persons, the wonder-workers, and, finally, the teachers or prophets ("true" and "false"), all of them powerful for good or evil.

Outstanding individuals, through the powers they possessed, whether directly or indirectly through their relationship to the gods, were more than "pillars of society" or "bulwarks of the constitution"; they were often felt to be, in a very realistic way, responsible for the welfare

IMPORTANT DEITIES IN THE EGYPTIAN PANTHEON

Although he had many aspects, Osiris (center) is best known as the god of the future life, king of the Otherworld. On the left is Isis, originally a virgin goddess but latterly his wife and the mother of Horus; she is here shown both with a human and with a cow's head, the latter identifying her with the mother goddess. On the other side of Osiris are Ptah, the creator-god of Memphis, and his consort Sekhmet, a goddess with the head of a lioness, crowned by the solar disk symbolizing the power of the sun.

Cairo Museum

of the land and people, from success in warfare to agricultural prosperity. The Book of Deuteronomy, especially Chapter xxviii, has familiarized us with the conviction that obedience to the divine will brings material blessings, whereas disobedience is visited by plague and warfare. But it is very necessary to observe that here the responsibility rests upon the behavior of the people of Israel as a whole, and not upon that of pre-eminent or authoritative individuals.

Actually, it is a widespread belief among simple peoples that ethical disorder affects the order of Nature; it is as though the laws to which men *should* adhere in order to progress, and those to which Nature *does* adhere in the course of a progressive evolution, were one and the same. It is as though the Laws of God and the Laws of Nature were parts of one system. The belief is characteristic of early stages of thought, and has been of fundamental importance in the development of ideas.

Now, in early society the group unit had a corporate responsibility: the whole suffered for the wrong-doing of one, or benefited by his good deeds. The group had an interest in promoting what it felt and found to be good for itself, and there was relatively very little individuality.

But, as a general rule, the tendency was for this responsibility to be transferred to special individuals, and so we have the idea of representative men who

at first possessed complementary responsibilities and privileges, rights and duties. They stand in a specially intimate relationship to the unseeen world, and a most interesting process in the history of religion is the way in which beliefs and

GOD OF THE RISING SUN

Horus is usually represented either as a majestic, hawk-headed god, or as the young son of Isis—a boy who holds one finger to his lips. He was identified with the king and kingly office, and was believed to slay obnoxious creatures.

Cairo Museum

practices at one time associated solely with these representative individuals were gradually extended to others, not without modification, so that the life and thought of the group as a whole was continually, though not continuously, being raised to a stage that approximated more nearly to the life and thought of the select few.

The institution of the "sacred man" or the "divine kingship"—that is, the special sanctity of the chief or ruler—has been instrumental in founding and establishing far-reaching ideas. In Babylonia the god was the lord and king of the city state, and the chief was his representative, the god's vicar on earth. His authority came from the gods, as also his insignia, and all he held was on trust: it has been a peculiarly pregnant belief that both land and people were, properly speaking, the god's. The ruler's name had been proclaimed by the god, or he was predestined from birth, or his election went back to time immemorial —in this way the legitimacy of his position could be secured. He was the chief priest of the god, the Pharaoh was the "champion" of Osiris, and, similarly, elsewhere the chief priestly offices were held by the king and the royal family.

The king's god was his father, his begetter; the goddess Isis was the divine mother of the Pharaoh. He was suckled by the goddess, and the Sumerian king Gudea addressed the mother goddess Gatumdag, who had borne him:

I have no mother, thou art my mother;
I have no father, thou art my father.

In like manner, Yahweh, as in Chapter xxxii of Deuteronomy, could be regarded as both father and mother. The passages illustrate the desire to describe the relationship between a man and his god as closely and completely as possible; and Egypt is remarkable for the extraordinarily realistic way in which it depicted the Pharaoh as the visible god, begotten by the god, and the divine begetter of his wife's children.

In Egypt it is expressively said of Rameses II: "Egypt has been the only daughter of Ra; his son is he who sits upon the throne." And in virtue of such relationship the gods Horus and Set were "brothers" of Thothmes III, and Isis and Nephthys were his "sisters." Semitic, and notably Biblical, names would describe a god as brother or father (Ahijah, Abijah), even as the Babylonian lawgiver Hammurabi was called "brother" of the god Zamama. Other Babylonian kings were the "dear consort" of their goddess, even as Israel was both the spouse and the first-born of Yahweh.

Such realistic ways of expressing intimate relationship recur when kinship is claimed with the sun, or, on lower levels, with totem animals; and this kinship becomes a virtual identity when, in one form or another, men imitate in dress or toilet their god, sacred ancestor, animal or totem. It is thus a concrete, physical imitation, the forerunner of the more ethical imitation of the anthropomorphic gods on the higher levels, when men are bid-

den to be like unto their Heavenly Father.

Nor was the close and loving relationship—the god "loves" the king—between the god and the district, or rather the representative individual, one-sided. The king was typically the "shepherd," and in Babylonia his symbol of office was the shepherd's crook. Often he was called the sun, or the sun-god himself; and as the sun was a symbol of dark-dispelling, all-searching light, so the sun-god was god of righteousness and justice.

But the chief had to do more than rule justly. "I cultivated grain and loved the harvest god," says Amenemhet I of the Twelfth Dynasty; and Rameses II is "lord of food, plentiful in grain, in whose footsteps is the harvest goddess." His word brings rain, for he is the great national god Ra in human form. The king, in fact, was directly or indirectly responsible for the entire welfare of the land and people. In consequence of Sargon's wrong-doing "the great god Marduk was angry, and he destroyed his people by famine," and a contemporary tablet of the privileges of Sippar, Nippur and Babylon tells how the ruler's evil could bring disaster to his house and the people.

When, indeed, such convictions prevailed concerning the sweeping powers of great representative individuals, any kind of disaster might be attributed to any defect—physical or moral—in the ruler. Rameses III calls himself an "abundant Nile," and the language may strike us as merely picturesque. But there could be a far more realistic meaning in it when the sacred king might be deposed or put to death because of a lack of rain or of other evils for which he was held responsible, or, as readers of Frazer's "Golden Bough" will understand, because there was a genuine fear lest any weakness of his, or approaching old age, should impair the success of those natural processes of rain, flood or increase of flocks upon which the fertility of the land and the life of the people depended.

OSIRIS WITH SISTER DEITIES

When attempts were made to reconcile the deities of different tribes in ancient Egypt, many triads were formed; this group consists of Osiris with the goddesses Isis, his consort (left), and her sister Nebhat (Nephthys) on the right.

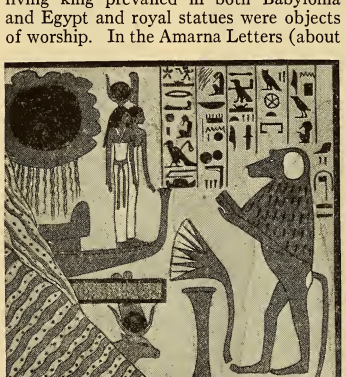
Cairo Museum

For the ruler was an obvious and convenient scapegoat. The official religion centered round him; purification and atoning rites were performed for the Babylonian king. He must observe certain fasts, penitential prayers were written for him, and the regal style, describing the deeds of the god and king, initiated a characteristic type of literature. The subordination of the ruler to his god is often found expressed in striking language; Akhnaton is called the "beloved son" of his sun god (Aton), "thy child who came forth from thy rays"; "thou hearest for him that which is in his heart, and thou doest according to that which comes forth from his mouth."

Such an intimate relationship, however, apt to become a mere convention, could also be genuinely felt; and it gave birth to a variety of beliefs and practices. The ruler's responsibility, as the representative of both god and people, and by

reason of the powers attributed to him, was such that he might be sequestered and hedged in by innumerable taboos, in which case the secular power would fall into other hands. Or he himself might exert secular authority and, as we learn in the old Indian Rig-Veda, have his "purohita" or domestic priest to perform the religious offices.

Again, while it easily happened that conspicuous individuals after death came to be regarded by a later generation as effective gods, the cult of the actually living king prevailed in both Babylonia and Egypt and royal statues were objects of worship. In the Amarna Letters (about



SOUL PASSES INTO THE WEST

The final stage of the journey made by the soul of a dead king, according to one Egyptian cult, was accomplished at nightfall, when it passed into the Mountain of the West, bound for the Other World, on the boat of the sun god, Ra.

1400 B.C.) the petty princes of Syria and Palestine address the reigning Pharaoh as "my sun god" or "my god." Yet, if at one time the representative individual was felt to be a more obvious and concrete god than the unseen powers of which he was the representative, at another, through his personal character or other causes, this too human symbol was repudiated. God was something better than this creature of flesh and blood! But these "individuals," these divine kings, must have had an immense influence upon the religion of their age.

Generally, the tendency in the history of religion has been to think of the gods and their realms in terms of outstanding individuals and mundane affairs, and then to reverse the process and take the convictions and traditions concerning the supersensuous realm as patterns, exemplars and starting-points for mundane life and speculation. These two processes can be traced everywhere; they are fundamental in the development of religion.

Convictions of an existence other than human, and of life after death, were alike shaped by common experience; but in the first instance they arose from universal experiences which compelled men to speak of an "other" and a "beyond." But men's ideas of death differed widely. Thus, in Babylonia there was a dark forlorn realm, the "land of no return," whither even the kings departed. The Egyptian, on the other hand, indulged in riotous speculation concerning the after-life, resulting in most hopeless confusion. What is at least clear is that to an Egyptian the other life was a replica of this, and that by means of prayers, charms and models of slaves and household objects provision was made on behalf of the deceased for his life in the tomb and for the satisfaction of his varied needs.

Death among many peoples is something anomalous: Man might have escaped mortality. A Babylonian myth tells how Adapa lost the chance of securing immortality for Mankind; the Babylonian Noah (Uta-napishtim, *see* page 261) alone passed to the land of the gods. Only the gods live, yet even they have their vicissitudes, and, no longer worshipped, are ignored and die, or lose rank and become mere demons, as was the fate of some of the great gods of old. The death and rebirth of the gods of vegetation, and the rites associated with the Babylonian Tammuz, did not arouse or strengthen a belief in the resurrection of individuals, as it did later in the more private and mystic rites of Attis. But men have usually "carried on" as though earthly existence was not the sum-total of all life; only when they began to reflect upon human destiny did haunting doubts arise.

Men of outstanding personality linger in memory, and can hardly be regarded

as dead; while the death of those to whom are attributed far-reaching powers (such as control of the weather) is a catastrophe, bringing a problem to be solved. How could the land continue without its all-powerful representative? Continuity—both political and cosmic—was secured by the dynastic idea in Egypt, in that every Pharaoh was the divine son of the eternal and self-begotten Ra. But as early as the old Pyramid Texts (Fifth Dynasty) there is passionate insistence that the dead king is alive: it is a protest, so to say, against death itself.

Even for the divine Pharaoh the journey to the home of the dead in the West was not an easy one. He is spoken of as the rain (which when alive he would be expected to control); he is a cosmic power like the sun god; he joins the sun and mingles with it, or, as was said later, "the divine limbs are mingled with him that begat him." He is identified with Osiris, the god (perhaps originally a deified king) who had died and was resurrected. But he has also an individuality of his own and he must make the journey as best he can.

There are remarkable spells and magical practices to facilitate the passage, to threaten or weaken gods and others who might stand in his way; the ferryman must be cajoled—the king is a pygmy who must be ferried across to dance before Ra and amuse him, as dwarfs and pygmies danced at the king's court! Ethical ideas, however, were not wanting; even as the god Osiris himself had to be vindicated or "justified" before he gained his place in heaven. Indeed, ethical requirements, though not prominent, can be traced throughout.

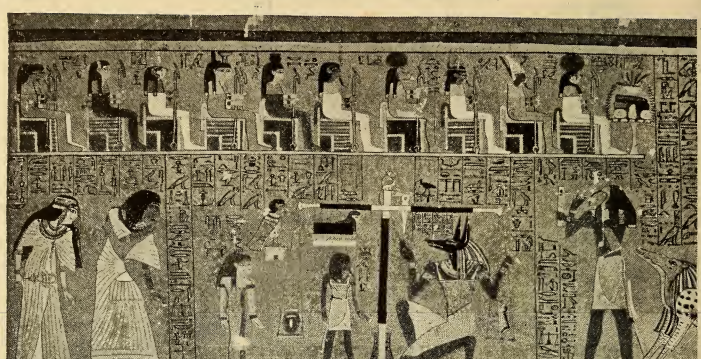
At a later stage of social development in the Middle Kingdom the ideas concentrated upon the Pharaoh were transferred to the nobles and officials. Ultimately the destiny of Osiris and his victory over death could be shared by all; but it is noteworthy that charms and amulets were indispensable, and a scarab laid on the breast of the deceased enjoined the heart not to testify against him at the judgement.

As a matter of fact, Egyptian ideas concerning the gods, death and the dead are too complicated and confused to admit of any simple statement. Righteous behavior, the help of a saving god, and—what required neither works nor faith—readily obtainable "passports": this triple road to the next world is not unique. That the dead could assist the living is obvious from necromantic and other practices; and as early as the Fifth Dynasty a priestly judge proclaims on his tomb his life of rectitude, and undertakes to commend to "the god" all who offer him food, clothing and ointment.

But immortality was also won by ensuring the immortality of one's name. The name and what it denotes were one in early thought; and to know the name of a god was a sign of intimacy, so that by learning the secret name of her father, Ra, the goddess Isis was able to acquire and use his powers. Statues and temples were erected with appropriate names believed to preserve the life of him named thereon, and it was a pious duty to restore the obliterated names of ancestors or perpetuate them by engraving them afresh on a new monument. In this way the name of the dead was made to "live," whereas that of an enemy would be mutilated or destroyed.

But the hope of ensuring that one's memory remained green could suggest less useful achievements; and while the desire to construct a permanent monument to one's name may partly explain the erection of gigantic pyramids, a grimmer rite—though the pyramids must have meant much misery and loss of life—and one bound up with certain obscure ideas of blood and of the supersensuous realm, was the slaying of prisoners to the god by kings like Amenhotep II and Rameses II that they themselves might live for ever.

Since religion was behavior rather than doctrine, and since human society and what we call "nature" were not clearly distinguished, ethical and ritual ceremonial offences—offences against men, the gods and the effective supersensuous powers—were equally dangerous, and brought their punishment. In Babylonia, as elsewhere, all bodily ills and misfortunes were the work of gods or demons, and we find amid incantations and prayers a list of possible offences of which the sufferer might have been guilty at some time or another.



DAY OF JUDGEMENT AS CONCEIVED BY THE EGYPTIANS

Having successfully escaped the many dangers of the journey westwards, the soul had one dread ordeal before it. The 'Negative Confession' had to be made to Osiris—a proclamation that the dead man's life had been not necessarily virtuous, but without vice. His heart, as this Eighteenth Dynasty illustration shows, was weighed by Anubis in the balance against Truth; if it failed to pass the test it was devoured by Amemit, the horrible monster crouched in expectation on the right.

From the Papyrus of Ani, British Museum

The list is in the form of a series of questions: Has he estranged members of the family—they are mentioned in detail —from one another? Has he neglected parents or insulted an elder sister? Has he failed to release a prisoner? For "No" said "Yes," for "Yes" and "No"? The list includes the use of false weights, the removal of a boundary, seizing a neighbor's house, shedding his blood, stealing his garment. Was his mouth frank, but his heart false? Was it "yes" with his mouth, but "no" with his heart? Has he taught what was impure, instructed in what was not proper? Did he follow the path of evil? Did he overstep the bounds of what was just?

Ritual error finds a place: Is it a sin against a god, a transgression against a goddess? Has he offended a god, neglected a goddess? Did he withhold an offering he was bound to make, enraging his god and his goddess? And at the end of the list comes the more "magical" command: "Loosed be all wherewith he is banned!"

Corresponding to what we may call the Interrogative Confession of Babylonia is the so-called Negative Confession of Egypt in the Book of the Dead, where the deceased is tried before Osiris, protesting his innocence, and his heart is weighed in a balance with the ostrich feather, the symbol of Maat, the goddess of Truth and Right. He states his integrity in the form of a series of negatives: I did not slay men, I did not rob, I did not steal, I did not stir up strife, I did not speak lies, I allowed no one to oppress the weak, I did not diminish the food in the temples or the offerings of the gods. The list is made up to forty-two statements, to correspond with the forty-two associate judges of the forty-two nomes of Egypt, and includes loud speaking, eavesdropping, avarice, adultery, depriving children of milk, catching the birds and fish of the gods, reviling the king, blaspheming the gods.

Moral requirements in themselves were nowhere rare, but we meet with no real penitence or reparation, and the lists include all that is considered reprehensible,

mainly in order to ward off the consequences.

Egypt stands out above other ancient lands by the way in which conduct during life was expected to affect the future life. In Babylonia we find an emphasis upon the offences of which a man may have been unconsciously guilty—an idea that naturally encouraged resort to charms and magic—and there was a more searching analysis of the subtle evils of falsehood and treachery. In Babylonia, too, the rewards and punishments were for *this* world. It was the height of wisdom to be godly and humane.

As Hammurabi's code shows, the particular ideas of right and justice were everywhere those of the age, and a distinction was hardly drawn between Right and what we call "rights," between Justice and what we should call our "dues." What we call "abstract" ideas were grasped only in actual, concrete examples of them. The code affords several striking illustrations of ancient class law, with, as is typical, fewer rights and less heavy penalties where the poorer classes are involved, either as victims or offenders; while the slave is almost without any rights. It was left for Hebrew prophets of later centuries, like Jeremiah and Ezekiel, and for Jesus, to preach true individualism, the supreme significance and sacredness of each and every individual, his personal rights and privileges, together with his personal duties and responsibilities (so often forgotten in course of time), even though, as in the Parable of the Talents, his endowments are small.

Religion and law were severed in the Babylonian code. This was an advance in the development of thought and in the analysis of law, but it tended to the decay of both religious and legal sanctions. One is tempted to believe that under Hammurabi's code the land was law-ridden, and that the laudable tendency to set down rights and penalties in black and white, and with remarkable fullness considering the age, defeated its object.

In like manner, the Sumerian and Egyptian priestly régimes tended to make men priest-ridden, and the well-meant effort to perfect the machinery of the relations between gods and men was as soul-destroying as the legal machinery of a Hammurabi. The centralization of government and religion was always liable to deprive the individual of all those local gods and rulers who formerly had been directly devoted to his interests; and the superior position which local saints (or "welis" in Palestine) are still apt to hold over the gods of the great national religions, and the growth of cults—local, private, and other than national—are among its typical consequences.

The part played in later ages by sacred history and tradition and sacred books is earlier taken by the myths of the gods —myths so sacred that often they were not to be idly repeated. To the Egyptian the myth of Osiris and his devoted wife Isis and his self-sacrificing son Horus inculcated homely lessons, just as later in India there were presented to all men in the story of Rama, Sita and Lakshmana simple types of filial love, wifely faithfulness and a brother's affection. The psychological value of the old and simple, though often crude and unnatural, myths needs to be borne in mind; for when the enthusiastic Pharaoh Akhnaton spread his rather subtle solar monism and attempted to eradicate ancient names and suppress long-known myths, his reform was more destructive than constructive. His was one of the most striking undertakings in ancient religion; and although it did not achieve its purpose, personal religion was, none the less, enriched.

In addition to the famous though short-lived religious movement associated with the name of Akhnaton, two others were destined to be of permanent significance for the world's religion. Of these the first takes us to an Aryan or Indo-European god, namely, Varuna, one of the many gods of the old invaders of India, who corresponds to the later Ormuzd, or Ahura-Mazda, the 'wise lord," the supreme god of Zoroastrianism.

Varuna's origin is uncertain, but he stands out conspicuously as a *moral* god, who more than any other of the gods of the Rig-Veda awakened the sense of moral guilt. To him above all was prayer made for forgiveness. If men sat together and schemed he was there as the third, and knew it; he was "all-seeing" and "far-seeing," and no one could flee and be free from "King Varuna." He punished all wrong, and men pleaded in extenuation:

Not our own will betrayed us, but seduction, thoughtlessness, Varuna, wine, dice or anger.

The old is near to lead astray the younger; even slumber leadeth men to evil doing.

With Varuna was closely associated Mitra, destined in centuries to come to appear as that Mithras whose cult, spread far and wide, was one of the most powerful rivals of early Christianity. Both gods, perhaps primarily "sky" and "sun," were essentially gods of covenant, guardians of the ordered life which rests upon implicit and explicit agreements.

Though it is not known how the god Varuna was introduced or whence he came —he may not be of Aryan origin—the history of religion proves that behind this god there must have been some ethical awakening, some great reformer or band of reformers, with convictions of an absolute order and with influence enough to imprint the god and his attributes upon the tribes from whom the ancient religions of India and Persia were derived. Could we but discover it, we should find some event in the history of religion which, in spite of the subsequent deposition of Varuna, is worthy to stand by the side of later and more familiar instances of new gods, that is, new conceptions of God planted in the hearts of men.

For, as an ethical god, Varuna may be placed next to the Israelite Yahweh, and the difference between the decay of Varuna and the strenuous and successful fight of Hebrew prophets to uphold the supremacy of Yahweh needs more consideration than can be given to it here.

How far back the religion of Yahweh goes we do not know with any certainty. The Old Testament gives us the traditions that prevailed in Israel; but it is important to remember that, although Moses is properly regarded as the most conspicuous figure in the rise of Yahwism, there were those who thought that Yahweh was known from time immemorial—from the days of Adam's grandson (*see* Genesis 4, 26).

Probably the god Varuna himself belongs to an earlier age, but it is a remarkable fact that, at the very age when Egypt, the Hittite area and the intervening lands were most closely interconnected, the gods Varuna, Mitra and Indra were among those already known in some part at least of Asia Minor. Among their names are compounds of "arta" (another form of "rita"), so that this noteworthy idea of "order" would doubtless be familiar at the Egyptian court of Akhnaton and elsewhere. Accordingly, while Akhnaton—"living in truth," as he calls himself —proclaims his interest in "truth," and the art of his day is distinguished by its efforts to represent things naturally, as they "truly" were, among the northern peoples we can trace both the conception of a natural order in the world and among men, and also the recognition of the ethical god Varuna, the guardian of "rita."

As to the effect such ideas as these would have on early Palestine we can hardly conjecture. Characteristic of Yahwism—as known from later writings—is the insistence upon the supremacy of the God of Israel. He is God of Man and Nature, but placed far above both; and His righteousness is an eternal principle such that those who offend Him, even His chosen people, His "firstborn," suffer as necessarily as those who obey Him prosper. The uniqueness of the prophets consists in what they taught as to the true way in which He was to be served; and their teaching, roughly six to eight centuries after Akhnaton—a dozen or more centuries after Hammurabi—is distinguished from all else that we know of by its ethical monotheism and the principles of national welfare and destiny.

But what the earliest Yahwism was like it would be difficult to say. It would hardly be inferior to the fine ethical teaching of Varuna; though, corresponding to the Indian Indra, the Near East had national storm gods like Adad and Baal with whom Yahweh lately came to be identified.

Early kings were associated with both the bull and storm god (Adad, etc.) and the solar god (Shamash, etc.), the latter being explicitly god of justice. In such cases the more national and the more ethical aspects coalesce, and Shamash and Adad would be one; a tendency towards monotheism can be recognized. Unfortunately we find only doubtful traces of Yahweh in the early contemporary records; and until we have the necessary evidence from excavation or the monuments, the problem of the rise of Yahwism remains unsolved.